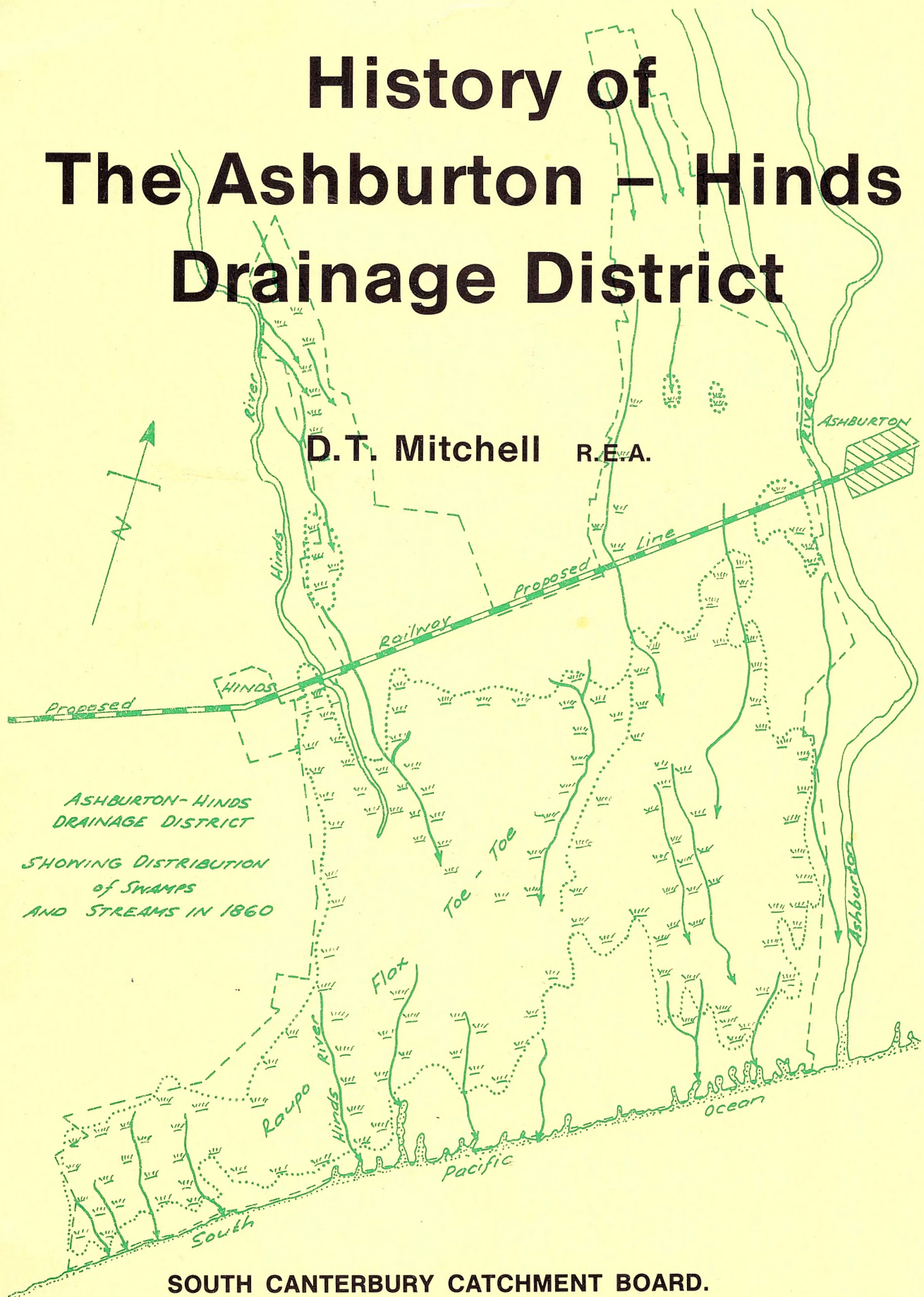
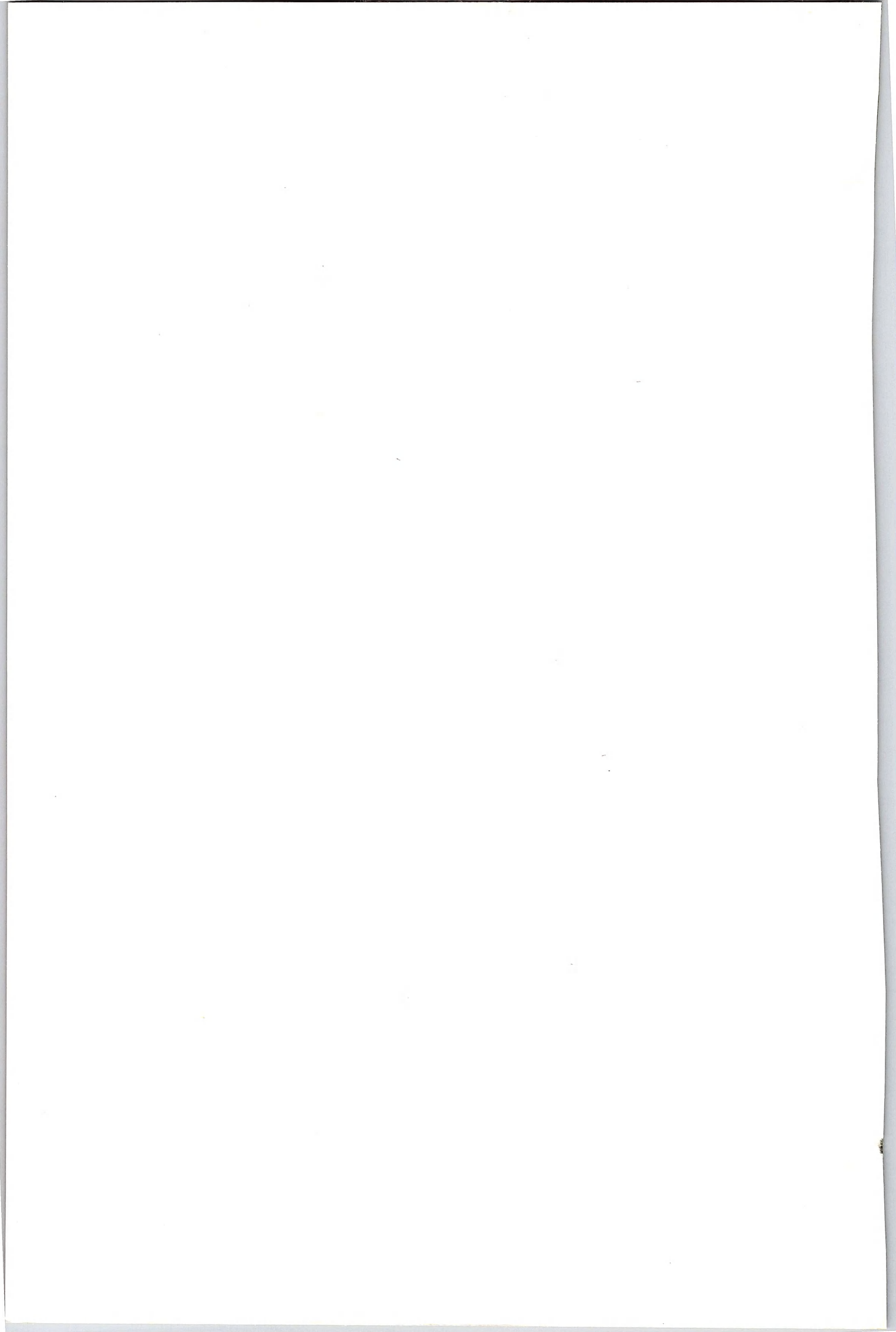


# History of The Ashburton – Hinds Drainage District

D.T. Mitchell R.E.A.



SOUTH CANTERBURY CATCHMENT BOARD.  
ASHBURTON  
1980



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## Foreword

Mr Mitchell's "History of the Ashburton-Hinds Drainage Scheme" is an epitome of land drainage throughout New Zealand. In the early colonial days large landowners were able to drain considerable areas of wet land, and then to maintain the drains. Later, for taxation or other reasons, the estates were broken up. The new landowners were usually aware of the original state of their holdings and fully appreciated the need for maintenance, but the next generation did not. Although county councils possessed the powers to initiate drainage schemes, the procedure, where there was a large number of small landowners, was cumbersome and usually involved much political lobbying.

In 1941 the Soil Conservation and Rivers Control Act set up catchment boards to control soil and river erosion and to mitigate flooding. Later the Act was extended to cover drainage and later still water allocation and irrigation. The setting up of rating districts and the obtaining of government subsidies were simplified and catchment boards were staffed by engineers specializing in water management. They recognised that continuing maintenance of river and drainage works was essential; in fact the Soil Conservation and Rivers Control Council made rating for maintenance a condition of granting a subsidy on capital expenditure.

The South Canterbury Catchment Board was fortunate in its Chief Engineer, Mr W. E. Lucy. He was in the forefront of the other catchment board engineers in seeking new ways to control willows in rivers and to clean drains more rapidly. His experiments with the use of 2-4 D to kill willows, and his development, with the help of his son's Meccano set, of the drain scraper, set a pattern throughout the country. Initially chemical weed control in drains was bedevilled by the effects on fish, but ultimately this was overcome and another stride made in effective drain maintenance. Finally it was found that drained land sometimes needed irrigation. This is a truism that has taken long to be generally recognised. If rivers are prevented from flooding, the protected land must be drained. If land is drained, it must be irrigated during dry weather.

Mr Mitchell and the South Canterbury Catchment Board are to be congratulated for placing on record a history of this scheme, which has not only restored, but also enhanced, the value of the land so laboriously drained by Grigg of Longbeach. Well may they say, in the words of an anonymous poet in "Concrete" of March 1955:

And yet the proudest story  
We feel we have to tell,  
Is not all things accomplished  
But this accomplished well.

**T. H. F. NEVINS**  
**F.R.G.S., F.I.C.E., F.N.Z.I.E.**

Mr Mitchell is to be congratulated on his efforts, which have resulted in a well presented and valuable historical record. Mr Mitchell brought to this task the same dedication and devotion he displayed towards his work over the thirty-three years he spent in the Board's service. The South Canterbury Catchment Board is indebted to Mr Mitchell.

**TIMARU**  
**November 1979**

**P. F. SCOTT**  
**CHAIRMAN**  
**South Canterbury Catchment Board**

## Appreciation

The writer, who has been associated with the South Canterbury Catchment Board and a member of its Ashburton staff since 1945, is especially indebted to the late John Hutton Grigg a grandson of the original John Grigg of "Longbeach" and many other longtime farmers and residents of the district for the consideration and assistance so generously given on matters relating to the drainage of the area and the history of the district.

Special thanks are extended to S.C.C.B. staff for their help and consideration. Also to the local Catchment Board members, G. A. Rountree, chairman, R. P. Davidson and A. R. Taylor who, following an address to a Federated Farmers meeting on Ashburton-Hinds Drainage Scheme maintenance at Eiffelton Hall on November 24, 1975 suggested that an attempt should be made to record in chronological order the history of drainage in the Ashburton-Hinds Drainage Area.

It is appropriate that this history of the drainage of a highly fertile area often described as "The best farmland in the world" should be produced at a time when we are celebrating the first 100 years of the Ashburton Borough, the main servicing centre for the Ashburton-Hinds Drainage District. It is also a time for reflection, to express gratitude and to acknowledge the wonderful pioneering work done by the early settlers, many of whom did not reap any advantage from their hardships and privations.

**D. T. Mitchell R.E.A.,**  
**Senr. Eng. Asst.,**  
**South Canterbury Catchment Board,**  
**Ashburton, July 15, 1978.**



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## CHAPTER 1

### History of the Ashburton–Hinds Drainage District

#### INTRODUCTION

##### Reason for this publication

This publication records the history of drainage of an area, which today is known as the Ashburton–Hinds Drainage District, from the early days of white settlement which began in 1854, four years after the first four ships sailed into Lyttelton harbour.

##### Boundaries of the Ashburton–Hinds Drainage District

The lands generally lie between the Ashburton and Rangitata Rivers extending from the coast inland for the most part to the main trunk railway line and further inland about 12.9 km (8 miles) along the south side of the Ashburton river and the north side of the Hinds river<sup>1</sup>.

##### Topography

The whole plains area between the Ashburton and Rangitata rivers is peculiar in that these rivers have no natural tributaries consequently both surface and underground waters flow down the slope of the land parallel to the rivers without reaching them except by artificial means.

The area shows a relative lack of relief and the entire area seems to represent a long shallow depression extending north and south between the rivers. The gradient from the 10m (35 ft) cliffed shoreline varies from 1:350 m (15 ft/mile) near the sea to 1:165 (32 ft/mile) towards SH.1.

Waters of the South Pacific Ocean roll up on to a shingle beach terrace, perhaps 27 m (30 yds) in width along which an irregular cliff rises vertically. It decreases in height from about 18 m (60 ft) near the Ashburton river to about 8 m (25 ft) south of the Hinds river, Lowcliffe area. In many places the coastal escarpment is broken by dongas both deep and shallow extending almost 1.6 km (1 mile) inland.

Remembering that the runoff from the plains almost back to the foothills, does not reach the rivers but flows underground and/or on the surface to the sea, it is obvious that this drainage district has a large aggregate catchment area extending as far inland as Mayfield and Ruapuna. It is known, too, that this huge alluvial fan which forms the Canterbury plains has gravel in places to a depth of 1.6 km (1 mile) or more.<sup>2</sup>

Thus water from the upper porous areas percolates into the subsoils and aquifers and travels slowly down country. It is obstructed by areas of peat, ironstone and clay loam rising to the surface causing springs and waterlogging. Further towards the coast porous ground again occurs where an acute surface water problem results from the high water table in the swampy areas above.

##### Geology

In order to assist the South Canterbury Catchment Board in its investigation, the Geological section of the Department of Scientific and Industrial Research carried out groundwater surveys of the area between the Ashburton and Hinds rivers, from the coast to the main trunk railway.

Mr R. L. Oliver's report of January 1946 states "The water seems to break through to the surface wherever there is porous gravel material or wherever a hard clay subsoil has sprung a leak. An impervious clay or ironstone layer keeps the water up.

The reason for the high water level in this area is related to its geological structure. During the formation of the Canterbury plains, gravel fans were deposited by the Ashburton and Rangitata rivers but the Hinds river, which was not a fan building river, merely deposited swamp material in the intervening depression. Much clay and other fine swampy detritus was deposited and also much "ironstone" was formed, so that the resulting accumulations consisted of much more impervious materials than did the gravel fans.

It is a well known fact that the groundwater level is higher in more impervious material and this is the reason for the water being near the surface in the Tinwald – Willowby – Eiffelton – Chatmos – Coldstream areas. Over the whole area, the gravels are rarely more than one metre (3 ft) from the surface and it should be possible to dig drains anywhere that matters to tap these gravels."

##### Soils

Soil map compiled and published by Soil Bureau (Kear et al 1967)\*.

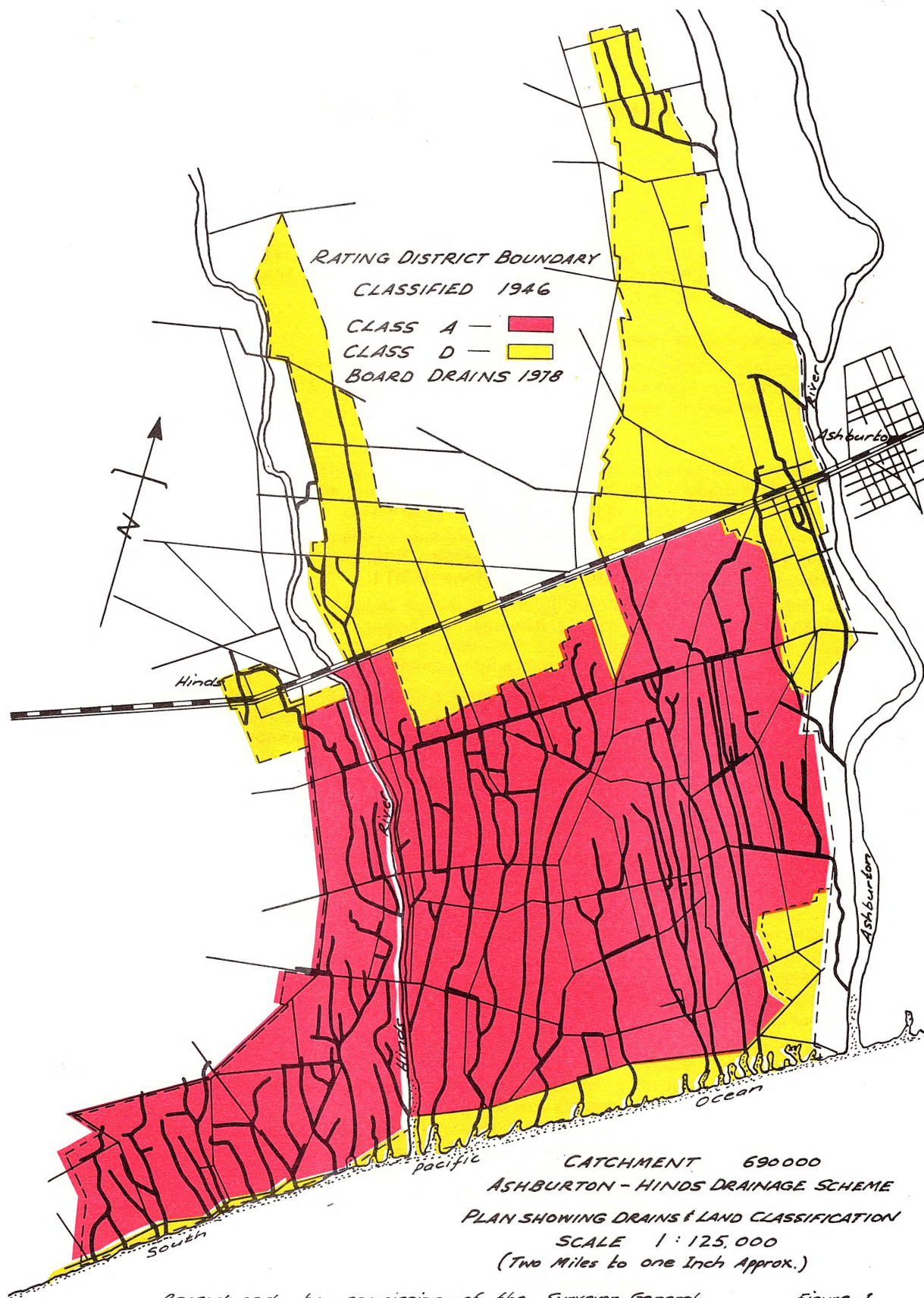
The variety of soils found within the Ashburton–Hinds Drainage District is exceptional. Within the Ashburton–Hinds Drainage District 27 soil types are recognised, a large number considering the area involved. There

1 see figure 1.

2 oil exploration bore 1969 J. D. George Pendarves. Abandoned 1650 m (5413 ft).

\* See figures 2 and 3.





appears to exist a greater diversity than in any other area of corresponding size within the Ashburton County. The parent material of all the soils is derived from greywacke and rests on thick gravel beds of great variety.

Soils are both loessical and alluvial in origin. Alluvium predominates between the Ashburton and Hinds rivers and below the railway line. The most fertile soils can be favourably compared in productive capacity with any soils in Canterbury. The poorest in their natural state have been improved by the application of fertiliser and manures. The peaty soils, of which there are four series classified, have developed in the low lying areas.

The soils developed with high water table (all the blues) occupy the largest area. Some are high in organic matter, others tend to be deficient in such. The subsoils are generally bleached or stained with iron oxide, but the topsoils vary in colour from a black to light grey.

Hardpans particularly of iron concretions are common at depths of 25 cm (10 inches) to 43 cm (17 inches) below the surface.

In general the soils of the area are moist and easily worked. They overlie a high water-table and are liable to become very wet. This becomes apparent wherever the drainage works are not functioning efficiently.

### Climate

Mr C. J. Seelye of the Meteorological office reported on the weather thus "The disposition of mountains, plains and sea, controls the weather in this region to a marked degree. Northwestern winds predominate over and near the mountains, but a daytime northeasterly is very common near the coast. When a depression is centred near Westland or develops off Canterbury, there may be steady rains with the majority of the heaviest fall with such situations."

### Rainfall

The avaral rainfall near the coast is 675 mm (27 inches) and near the foothills 1000 m (40 in). At Ashburton Borough for the period 1909 to the end of 1977 the average annual rainfall was 750 mm (30 in) with fluctuations from 381 mm in 1915 (15.24 inches) to 1146 mm in 1938 (45.84 inches) for the period over 69 years.

#### ASHBURTON BOROUGH PARK RAINFALL

1965/77 in millimetres

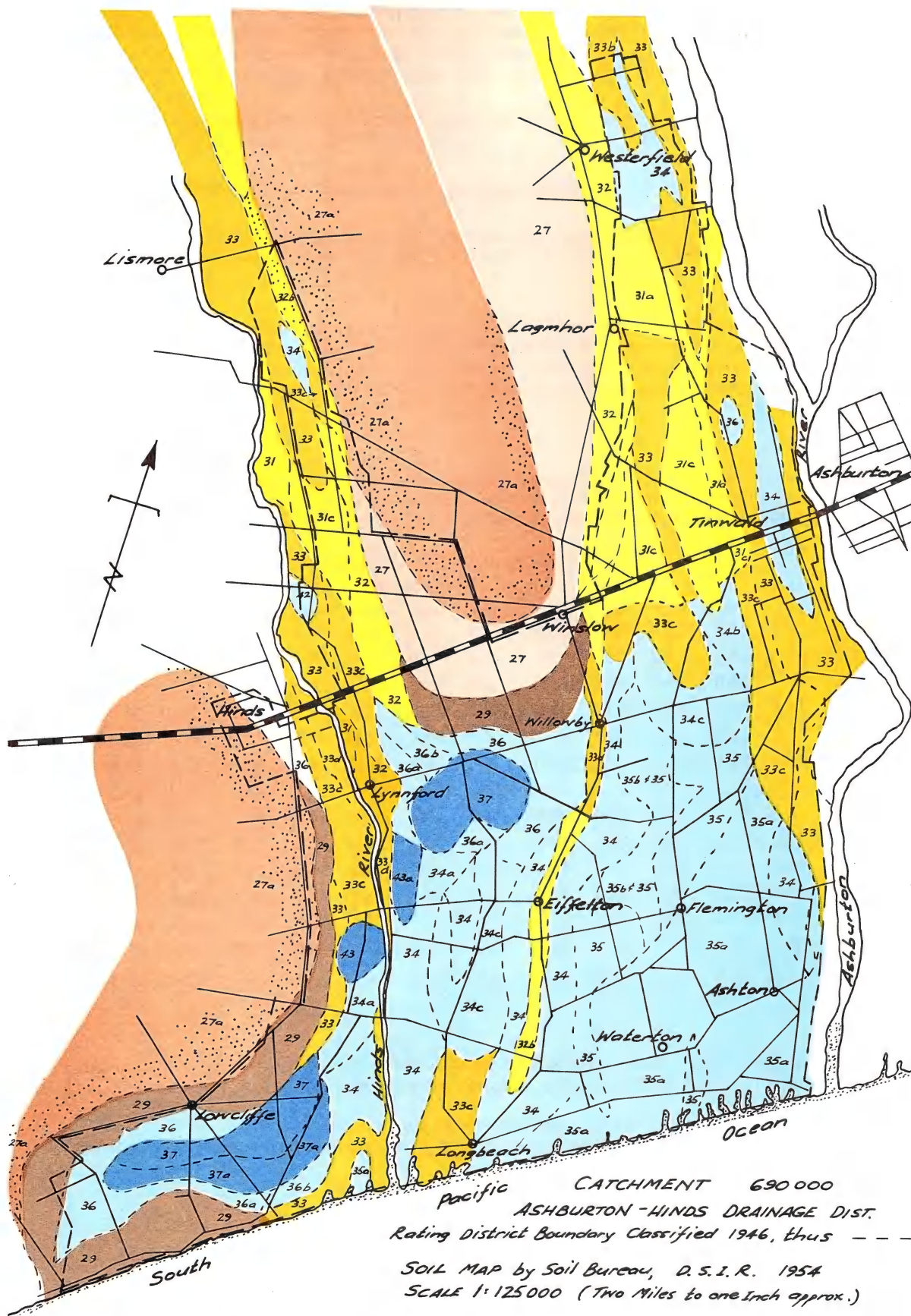
Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	ANNUAL
1965	97.0	42.4	102.4	99.3	38.3	53.3	70.9	35.2	38.5	43.7	105.7	59.9	786.6
1966	56.6	52.8	74.7	39.4	67.6	2.0	75.4	92.7	21.3	77.0	81.0	43.4	684.0
1967	55.4	38.9	61.5	66.5	44.5	17.5	19.8	80.3	28.2	68.3	165.3	25.4	671.6
1968	78.2	59.9	51.8	224.3	35.6	71.1	116.3	22.6	61.5	33.3	58.9	91.7	905.3
1969	63.5	12.9	20.6	50.0	59.7	11.7	33.5	17.5	33.5	40.9	16.0	123.2	483.1
1970	70.4	39.9	100.1	17.8	55.6	116.6	67.1	31.5	58.9	30.5	47.7	46.0	684.5
1971	48.0	24.9	28.7	21.6	75.4	103.6	50.4	31.2	54.8	42.0	40.8	27.2	548.7
1972	75.0	26.0	31.2	69.2	90.7	30.8	45.4	32.5	14.3	96.2	42.5	36.5	590.3
1973	37.2	32.8	34.6	33.7	48.2	39.4	33.6	224.2	26.5	29.3	34.7	56.9	631.1
1974	48.4	79.4	70.5	188.3	74.3	45.9	75.2	51.2	86.5	103.5	6.3	51.6	881.1
1975	142.6	83.1	80.0	62.7	11.0	111.6	54.5	173.6	31.4	77.6	55.1	24.8	908.0
1976	35.6	67.5	30.3	38.5	31.8	46.1	40.1	73.7	49.7	77.3	28.4	139.6	658.6
1977	68.3	79.5	9.0	43.9	63.7	108.6	72.5	57.5	95.6	22.5	22.1	65.0	708.2
<b>Monthly Average</b>	67.4	49.2	53.5	73.5	53.6	58.3	58.0	71.0	46.2	57.1	54.2	60.9	

### Storms

Since the completion of the capital drainage works of the Ashburton-Hinds Drainage Scheme late in 1952, and in the period to the end of 1977, weather statistics show the following events which would have affected the water table,

- 11 daily rainfalls of 50 mm and heavier with one over 75 mm.
- 12 two day rainfalls of 75 mm and over with three over 100 mm, two over 125 and one over 150 mm.
- 2 four day rainfalls of 175 mm and over.
- 1 seven day rainfall of almost 200 mm.





Reproduced by permission of the Surveyor General.

Figure 2

*CATCHMENT 690000*  
*ASHBURTON HINDS DRAINAGE DISTRICT*  
*SOIL MAP LEGEND*

*To be read in conjunction with Soil Map, Figure 2*

*LEGEND*

<i>Lismore stony silt loam</i>	27
<i>Lismore very stony loam</i>	27a
<i>Lowcliffe silt loam</i>	29
<i>Templeton silt loam</i>	31
<i>Templeton silt loam on sandy loam</i>	31a
<i>Templeton shallow silt loam</i>	31c
<i>Eyre stony silt loam and shallow silt loam</i>	32
<i>Eyre very stony sandy loam &amp; very stony silt loam</i>	32b
<i>Wakanui silt loam</i>	33
<i>Wakanui silt loam on sandy loam</i>	33a
<i>Wakanui shallow silt loam</i>	33c
<i>Wakanui sandy loam</i>	33d
<i>Temuka silt loam</i>	34
<i>Temuka silt loam, peaty phase</i>	34a
<i>Temuka silt loam on clay loam</i>	34b
<i>Temuka shallow silt loam</i>	34c
<i>Waterton silt loam</i>	35
<i>Waterton shallow silt loam</i>	35a
<i>Waterton clay loam</i>	35b
<i>Willowby silt loam</i>	36
<i>Willowby silt loam, peaty phase</i>	36a
<i>Willowby deep silt loam, peaty phase</i>	36b
<i>Windermere loamy peat and peaty loam</i>	37
<i>Windermere shallow peaty loam</i>	37a
<i>Taitapu silt loam</i>	42
<i>Waimairi peaty loam and loamy peat</i>	43
<i>Waimairi shallow peaty loam</i>	43a

*Reproduced by permission of Surveyor General*

*Figure 3*

### Ashburton Borough Rainfall — Maximum Recorded, for Short Periods 1909 to end 1977 in m.m.

		1 day	2 days	4 days	7 days
June	1911	73.9 mm	110.4 mm	129.5 mm	133.4 mm
July	1912	59.9	87.6	90.4	123.2
May	1923	116.3	158.8	177.3	214.9
June	1929	52.8	86.0	97.8	97.8
July	1929	55.9	75.7	102.6	104.9
February	1936	121.2	165.4	172.2	177.5
March	1936	75.4	112.3	126.0	126.0
April	1938	53.8	58.9	68.8	—
June	1938	—	59.9	97.3	120.4
July	1938	—	63.5	121.9	147.3
March	1941	105.4	170.2	212.3	212.3
December	1944	59.2	68.6	83.6	86.9
February	1945	106.7	179.6	182.6	182.6
February	1946	63.7	63.7	—	—
May	1946	66.0	66.0	—	—
October	1950	56.4	81.8	—	—
December	1950	57.1	57.1	—	80.8
November	1952	55.9	129.5	139.7	—
December	1954	65.8	116.1	143.8	—
May	1957	50.8	91.7	104.9	149.3
May	1959	55.4	87.4	104.4	110.7
June	1960	60.9	80.5	123.7	135.1
April	1963	—	79.8	—	—
November	1967	—	79.2	121.9	124.2
April	1968	67.3	129.3	178.6	197.4
"Wahine" storm heaviest Ap. fall on record.					
July	1968	62.5	81.8	—	—
August	1973	86.4	162.4	179.7	—
April	1974	60.8	91.0	—	—
January	1975	55.7	—	—	—
June	1975	52.0	89.1	104.2	—
August	1975	52.6	88.7	107.1	113.0

Without an adequate drainage system rainfalls such as these could well cause waterlogging and damage to crops in seasons which follow earlier wet conditions. Farmers are now able to get on with ploughing and preparation for crops one week after a "big rain" whereas before 1945 many months elapsed before the land again became fit for cultivation.

This drainage system has generally been adequate for the rainfall pattern expected apart from a few exceptionally heavy falls such as occurred in May, 1957, when many drains overflowed for one day due to exceptional run-off on saturated land and high groundwater levels. The April, 1968, known as the "Wahine Storm" was on a level with the May 1923, March 1941 and February 1945 storms in the pre-South Canterbury Catchment Board era and one that could be expected as the scheduled recorded falls for short periods show, as occurring once in every 17 years.

## CHAPTER 2

### Early History

#### The Primitive Landscape

The area of the Ashburton-Hinds Drainage District is 31,769 ha (78,500 acres). The wet areas at Lowcliffe, Isleworth, Chatmos, and Lynnford east of the railway and Tinwald, Westerfield and Moronan to the west were not within the boundaries of Longbeach and were not drained or developed so dramatically or to the same degree as was the Longbeach property.

Longbeach territory ran south from the Ashburton river and to the west of Wairuna Creek (now known as Boundary drain) formerly known as the Hinds river<sup>1</sup> a distance of approximately 13 km (8 miles) and inland from the coast for 11 km (7 miles).

In 1854 this area was leased under pastoral licence from the Crown in two runs numbered 51 N.Z.R. and 45 N.Z.R.<sup>2</sup> and in the next 10 years saw several quick changes of leases until John Grigg who had emigrated from Cornwall, England to Auckland in 1855 took over the area known as Longbeach in 1864.

During the next seven years he continued a policy of freeholding by the then popular method of "gridironing" and by 1871 he was the owner of the whole Longbeach area of 32,000 acres (12,950 ha.)

<sup>1</sup> It was termed such on the original survey maps until a new artificial channel was constructed 1867-1870 and termed the Hinds river.

<sup>2</sup> NZR — New Zealand Regulations.



What a contrast between the impenetrable swamp of pre-colonial times and the Longbeach estate of today. In the early years of development the land was used solely for grazing of cattle. Through the pressures of economic circumstances, it was effectively drained in a gigantic operation organised and controlled by John Grigg.

What a tremendous task John Grigg must have had to undertake the drainage of what is described in the first survey map of 1860 as an impenetrable bog of water, toetoe, raupo, niggerheads and flax. The outer perimeter of the swamp extended from Coldstream to Lowcliffe, along the Isleworth Road to Boundary Road below Hinds, thence to Tinwald, Wheatston, Ashton, Waterton, Longbeach and following above what is now known as Lower Beach Road to Coldstream. The area of the inherently wet swamp land was 18,180 ha (44,922 acres)<sup>1</sup>.

The deepest part of the bog as described by John Grigg in those first years of white settlement was an area of over 26 sq. km. (10 sq. miles) below Black Bridge on Surveyors Road. The writer's view is that in extremely dry periods with little or no groundwater or springs, or Hinds river flowing into the 181 sq. km. (70 sq. miles) swampy area, the swamp would diminish and would in fact reflect the dry and the wet seasons.

Historians have praised John Grigg for his foresight in seeing the agricultural possibilities of a dismal swamp. They have praised him for the determination with which he backed his judgement; for the enterprise and skill which led him from success to success in his projects and, above all for a spirit which refused to bow down under disappointments and which treated difficulties as obstacles to overcome.

### **INITIAL CONCEPT OF DRAINAGE POSSIBILITIES AND PRIORITIES**

Unfortunately all records of John Grigg's mammoth task of draining the swamp were lost when fire destroyed the Longbeach Homestead in 1937. Among those records which would have shed light on his approach were details of the field tile system which totalled 240 km (150 miles).

Mr J. H. Grigg told me that his grandfather made the decision to take up Longbeach after several days on horseback inspecting the primitive landscape. The main problem as he saw it was that the Hinds river had no permanent outlet to the sea but spread into the swamp below the present Boundary road aggravating the bog problem. He considered the deepest part of the swamp could be drained by constructing a new outlet channel along a relatively dry ridge over 6.4 km (4 miles) in length, to a coastal gully which extended inland from the coast about 1.6 km (1 mile) and 1.6 km north of the present Boundary drain which was a flood course from the swamp.

He realised the swamp in the north could be drained by using the many flood gullies extending inland from the 10 m (35 ft) high cliffed shoreline.

## **CHAPTER 3**

### **The Original Drainage Operations**

#### **HINDS RIVER — DIRECT CUT TO THE SEA. 1867–1870**

The drainage of the estate involved three separate problems each being solved in a different manner. They were in order of execution, a new outlet channel and confining of the Hinds river, the development of a system of open drains and later where necessary a piped drainage system using fired clay field tiles.

From observations John Grigg came to the conclusion that the principal reason for the existence of the swamp was that the Hinds river ran into the swamp between Surveyors and Boundary roads. The area adjacent was probably one of the deepest parts of the swamp. He, therefore, decided to excavate an artificial channel which would lead the water into a convenient coastal gully somewhat larger than the others and stretching about 1.6 km (1 mile) inland and 1.6 km to the north of the nominal Hinds river.

The work was carried out between 1867 and 1870 by the use of horses, scoops and shovels for a distance of 6.4 km (4 miles) following a strip of relatively higher land for the most part and leading into the heart of the swamp. Between the banks the distance was 20 m (1 chain) and the depth 1.8 m (6 ft) on the average while the removed spoil was formed into stopbanks 20 m (1 chain) back on each side.

The first obstacle was overcome and the Hinds river had a clear course with a direct outlet to the sea, as it remains today.

#### **DRAINAGE OF SWAMP BY OPEN DRAINS 1870–1884**

Following the completion of the Hinds river project it was realised that there were still extensive areas of swamp which remained relatively unaltered. Local rainfall accumulated in the swampy area away from the Hinds river and the water table, also fed from up country, became very high. (See p.7 Topography).

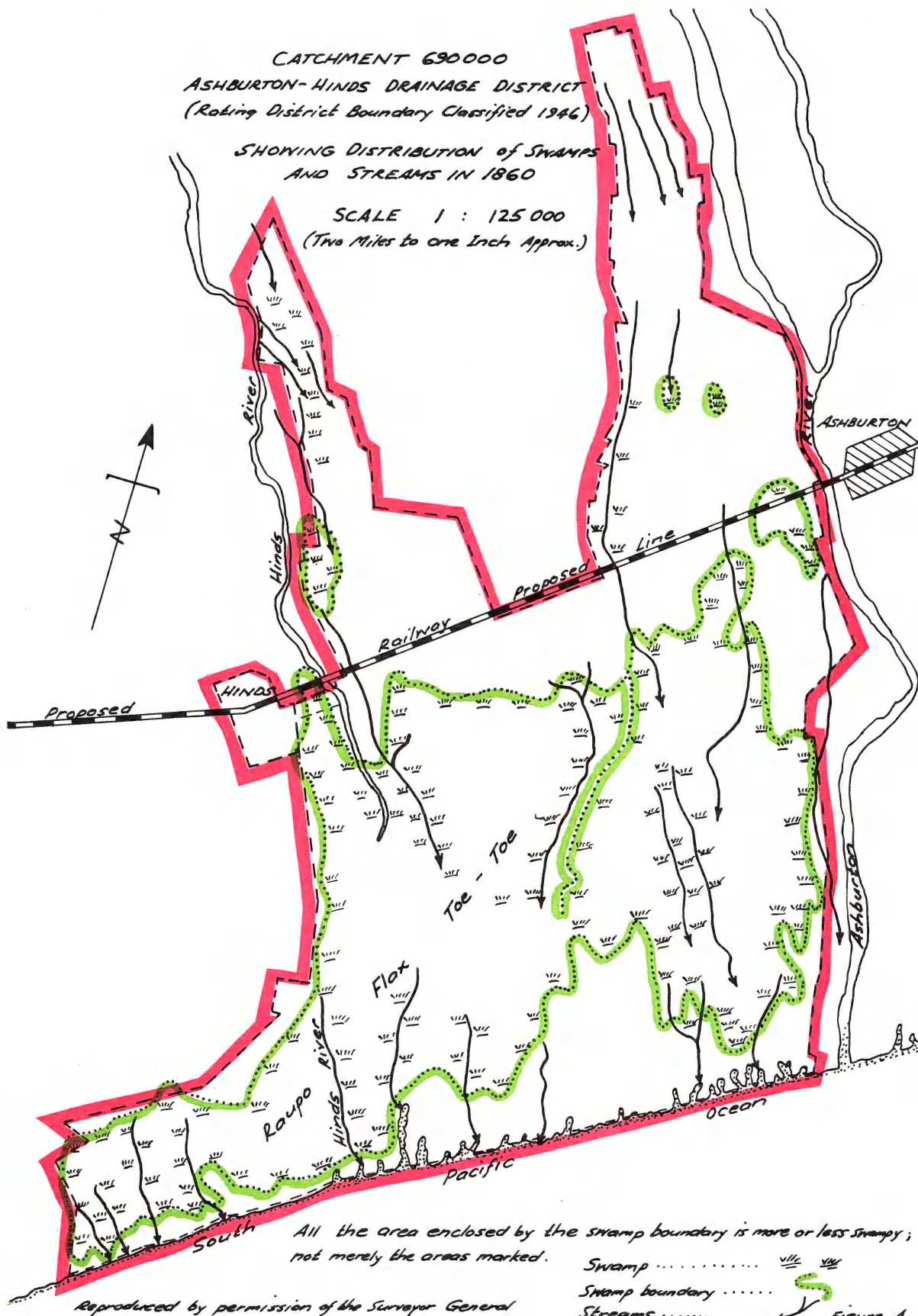
Leads or open drains were formed through the swamp, some into the new Hinds river, but the majority direct to the sea via existing coastal gullies. As with the Hinds river cutting, some drains were constructed on ridges of slightly higher elevation to enable more excavation by horse and scoop. Meandering courses were straightened and by the year 1884, 241 km (150 miles) of main lead or outfall drains were completed.

During this period John Grigg brought out from England a surveyor named Bryant for the planning and drainage surveys. In the final stage of field tile drainage his services must have been very necessary and invaluable to Longbeach.

<sup>1</sup> See figure 4 — The Primitive Landscape.

SHOWING DISTRIBUTION of SWAMPS  
AND STREAMS IN 1860

A hand-drawn diagram consisting of a single line with an arrowhead at the top right. A zigzag line segment is drawn across the middle of the main line.





The drainage of the swamp was a winter occupation for many of the estate employees. A mobile "Drainage Camp" of tents comprised their dwellings. Where possible, use was made of horses and scoops, but much supplementary hand labour with the use of shovels and other special drain tools was needed. Working in the dead of winter in the brown swamp water, without the protection of gumboots was undoubtedly an onerous task. The worst obstacles encountered were occasional trunks of former swamp forest which had slowly sunk through the peaty surface of the bog.

The permanent Longbeach staff during this period was 150 men and at times up to 200 were engaged at the drainage camps. Many of the casuals were probably from the Otago goldfields with an expertise in digging cross fall drains and channels, similar in a way to diverting water to gold sluicing claims.

#### **PIPED DRAINAGE SYSTEM. 1884–1903**

Although the open drains completed in 1884 had been very successful, there remained numerous local areas where waterlogging of the soil resulted from the surfacing of underground water which had seeped from up country. Each spring was purely a local phenomenon, no pattern being discernible. Its influence may have extended across a number of paddocks, or perhaps a section of one, depending upon its volume of flow. At least the presence of the groundwater was sufficient to seriously interrupt or to completely prevent agricultural operations.

It became apparent after 1884, following surveys by Bryant, that a system of pipe drains to dispose of seepage water was essential. The cost of pipes and transport from the nearest markets of Christchurch and Timaru was prohibitive, so a brick making expert, Samuel Hillyer from near Waimate, was engaged. He discovered suitable clay close to the present district of Eiffelton near Surveyors Road.

Between 1886 and 1889 three kilns were erected, the last of which was an extensive structure with a 18 m (60 foot) chimney<sup>1</sup>. The total output by Hillyer, his three sons and six men was one million tiles by 1896. Also tiles were supplied to surrounding farmers usually former workmen who had bought land from the estate.

Hillyer and his men were turning out a batch of field tiles each fortnight. In one year 64 km (40 miles) of drainage tiles were laid by hand. By 1900, 241 km (150 miles) of 10 cm (4 inch), 15 cm (6 inch) and 25 cm (10 inch) diameter pipes had been laid.

The last area to be drained was the property on the south-west side of the Hinds river. Today many of these pipe drains are still working most efficiently.

By 1903 drainage operations were completed and so effective were they that during several excessively dry seasons a shortage of domestic and stockwater was experienced, especially in 1915 when the rainfall was an all time low of 383 mm (15.08 inches).

The gradual transformation of the landscape was attributable to the success of the complete drainage operations whereas in 1871 the value of the land was \$10 per ha. (£2 per acre) by 1906 the capital value exceeded \$50 per ha (£10 per acre).

## **CHAPTER 4**

### **Subdivisions and the Rise of the small farm**

The introduction of marine refrigeration in 1882 encouraged by John Grigg led to the development of a new form of land use in Canterbury — that of small scale mixed arable farming.

From 1895 to 1921 the price of wool, mutton and dairy produce rose more than the price of wheat and these industries expanded rapidly. At the same time the landless also realised the potential and profitability of mixed farming, with the result there developed a land hunger, and agitation for closer settlement.

The majority of large landholders were in debt and their large scale methods of land use could no longer be conducted profitably. This was not so on Longbeach as portions of the estate had been sold since 1871 and because the cost of the drainage had been expensive and agricultural prices low, Thomas Russell, the financial partner, and brother-in-law of John Grigg decided in 1882 to withdraw his investment.

Thus by 1882 one half of the area of the estate had been sold to farmers as economic holdings. Many of these were former Longbeach employees, thoroughly trained in farm management. About 110 farms were established in various lots from 65 to 130 ha (160 to 300 acres) at prices varying from \$50 to \$80 per ha. (£9 to £15 per acre). But even in 1882, during a conducted tour of the subdivided area John Grigg could scarcely believe the progress that had been made in less than 20 years — the well formed carefully tended roads, the extensive drainage, the kilometres of well grown live fences, the well cultivated farms, the homes everywhere surrounded by plantations in every state of advancement and all this from an impenetrable swamp.

For 20 years or more after 1903 when John Grigg's drainage scheme was completed, farmers in the subdivided areas were conscious of drain maintenance and hastened to follow the example of drain cleaning set by Longbeach. Many of the farms were sold and resold. Many of the new occupiers were oblivious of the significance of the events of the past. Similarly a new generation was inheriting the remaining farms. To all intents and purposes they regarded their contemporary landscape as having always been a permanent

<sup>1</sup> Unfortunately this well known landmark from which Eiffelton received its name was demolished in 1947 by a James Curle the sole reason being to obtain structural steel for trailer hubs.



feature. On the remaining Longbeach estate now down to 1,300 ha (3,200 acres) The occurrence of regular drain cleaning proceeded, little known to land occupiers on the subdivided areas above.

#### **REVERSION – BACK TO WET LANDS. 1935–45**

The deteriorating condition of the landscape can be attributed only to continued neglect on the part of the land occupiers. Through lack of maintenance, the many open drains and side channels became weed infested and clogged. Courses of some drains were diverted to suit fencelines or the whim of the occupier without reference to anyone, and side channels were neglected or ploughed in.

Many farmers planted willow trees, not only for shade and shelter, but to consolidate the ever increasing lateral bank erosion caused by neglect. The willows spread rapidly, their copious roots choking the open drains, entering and effectively rendering useless much of the field tile drainage system. Ever widening patches of water-logged ground were often the very first indications to the land occupier that he did, in fact, possess a pipe drain system under his property. In the Willowby district named after the willows planted alongside the drains the writer has seen a continuous mat of fibrous willow roots 12 m (40 feet) in length removed from the outlet end of a blocked 25 cm (10 inch) pipe drain.

#### **RELATED PROBLEM – CHOKED HINDS RIVER**

A related problem was presented by the Hinds river. As previously mentioned, the lower Hinds river channel below Surveyors road was man-made and constructed on a ridge.

This difference in elevation was accentuated not only by subsidence of adjoining areas of peaty soil, but by the unrestricted growth of willow trees in the bed of the river and gigantic "old man" willows eroding in from the banks thereby compounding the problem. The bed of the Hinds river over its lower 27 km (17 miles) was so cluttered and obstructed with willows and eroded bank detritus that overflows occurred on many frontages from "Mulligans" bend above Moronan bridge to the sea and affected some 14,000 ha (34,500 acres) during spasmodic floods. A similar if less significant problem of flooding developed from the Ashburton river to the north-east.

#### **50% DROP IN PRODUCTION**

The drainage system functioned so efficiently before 1935 that, during excessively dry seasons water was in very short supply. However, in that year wet patches began to develop in the inherently wet land during periods of abnormally high precipitation. Rushes began to grow. These were the first effects from accumulated neglect, thus indicating to farmers the necessity of co-operation in improved drainage. Such work was, however, futile unless the water had a sufficient outlet through the property below. This was seldom the case, and land occupiers had little incentive to undertake the operation of drain cleaning without organisation. Thus developed a veritable vicious circle.

The area of land within which cultivation became difficult, extended, and from being a spasmodic occurrence "water logging" became a permanent feature. It was significant that the areas presenting so much difficulty were precisely those which, during the 1870s required the most intensive of the drainage operations. Production in the area for the period 1935–1945 dropped 50% — much of the area was fast reverting to rushes and swamp. The lesson that any job that is done is only as good as the maintenance thereafter was not learnt and ground conditions steadily deteriorated.

## **CHAPTER 5**

### **The Rising Water Table and Petition to Ashburton County Council**

During September 1939 following a dry winter the depth of the water-table across the "wetter" area (the lower margins of Chatmos and Willowby) was less than 30 cm (1 foot) from the surface. six km (4 miles) inland no water was evident at 3 m (10 feet) while 3.2 km (2 miles) below, in Eiffelton and Flemington, its height was only 1.2 m (4 feet) below surface level. Surfacing water tended to follow old winding and at times imperceptible depressions. The most seriously affected areas were soon supporting an ever increasing carpet of swamp vegetation, predominantly rushes which retarded the evaporation of surface water.

Alarm within the rural population grew. It had become increasingly clear that, in spite of many constructive attempts on the part of individuals, diffused control of drainage operations could not, even under urgent appeals be successful. Therefore in 1939, the land occupiers petitioned the Ashburton County Council to declare a drainage district for the purpose of undertaking the necessary drainage work.

#### **ROYDS' REPORT TO ASHBURTON COUNTY COUNCIL**

##### **Report on Ashburton Hinds Drainage Scheme**

The Ashburton County Council wasted no time and engaged H. G. Royds a well known and respected consulting engineer to report on the area bounded by the Ashburton river, Main South Railway, Coldstream Road and the sea, totalling 321 square kilometres (124 sq. miles) but Royds found, however that further areas to the north-west of the railway line belonging to the same system of watersheds had to be included in the investigation and in some cases required improvement. His report covered most of the land requiring drainage improvement between the Ashburton and Hinds Rivers and a large portion of that between the Hinds and Rangitata Rivers.



For convenience the total area to be improved was separated into blocks each having a separate system of drainage as follows:

	Sq. Km	Ha.	(Sq. miles)	(Acres)
A. South of Hinds River	114	11,394	44	28,160
B. Hinds River to Ashburton River	275	27,448	106	67,840
Totals	389	38,842	150	96,000

The investigation extended beyond these areas and covered about 518 square kilometres (200 sq. miles).

Royds reported on the conditions in each block as follows:

**“Block A (South of Hinds River).** During 1938 heavy precipitation in the light country above Hinds caused the ground water level to rise to such an extent that it broke to the surface in the form of springs at several places near Hinds. This was very evident along the Old Main Road which became dangerous to traffic. Due to saturation no further water could be carried in the ground and it flowed in sheets on the surface for weeks on end in the vicinity of Hinds and in different courses from there to the sea. The Lowcliffe area also suffered badly through similar causes. Near the coast the surface water problem was acute.”

**“Block B (Hinds River to Ashburton River).** The portion of this block adjacent to the Hinds River, largely good cocksfoot and cropping country is very badly affected by a drain which rises 34 km (21 miles) from the coast above Moronan and flows not more than 1.6 km (1 mile) from the Hinds River and parallel to it to enter the river near New Park Road having therefore, a total length of 26 km (16 miles). This watercourse is far too small and overflows to such an extent that the main highway has been blocked and the land near Lynnford is sometimes entirely flooded for long periods. Windermere, Chatmos and below are also badly affected from part of the same catchment which has been artificially diverted. The Parakanoi drain which was originally an important natural watercourse parallel with Longbeach Road is in a very bad state and overflows in large volumes over the road so that water pursues entirely unnatural courses towards the sea.”

“In the portion of this block between Longbeach road and the Ashburton River existing drains are too small. There are three natural creeks which can be traced above the railway line, Lagmhor, Remington and Brook creeks. The latter two have been diverted into small water races and their flood waters flow across country in the direction of Willowby and Flemington in an erratic manner, causing damage in both these localities. Lagmhor creek with an even larger watershed has been maintained for a short distance through Tinwald but lower down is only about 60 cm (2 feet) deep and overflows. Attempts have been made to cut it off at Jacksons road and Timaru Track but due to faulty construction these cut-offs are not effective. Another diversion, the Wheatston drain near Flemington has been built largely to intercept the water overflowing from Lagmhor creek but this is only effective because of small culvert capacities and uncontrolled water-race offtakes which allow the floodwater to pass the diversion drain.”

“Sufficient has been said to show that the existing drainage system is chaotic. In fact, it cannot be called a system at all. The result is that in wet seasons a large proportion of the country is either waterlogged or inundated. Even in dry seasons waterlogging is still apparent in places and over the whole area farmers feel no security in planning their operations for fear of the consequences of a wet spell.”

“The condition will become worse if a proper drainage system is not undertaken.”

As regards field surveys Royds said:

“As very little of a comprehensive nature was known about the course of existing watercourses these were all traced on the ground and plotted. From this information a general scheme of improvement was devised. In all about 160 km (100 miles) of levelling was done and further bench marks established to facilitate the levelling for the survey of the drains in detail later.”

“During the survey opportunity was taken to discuss with farmers their farming problems and of the 123 interviewed 55 complained of surface water, 14 of groundwater and 54 attributed their difficulties to both causes.”

#### Outline of Royds Improvement Scheme

Royds' proposals were that where possible long drains or flood water courses running for miles parallel with the rivers should be intercepted by cut-off drains and turned into the rivers. This would have the effect of reducing some of the very large catchment areas and give a greater measure of control and a greater factor of safety than would be obtained simply by enlarging the long existing drains. This system would be impracticable to apply to drains remote from either river e.g. Parakanoi and Home Paddock drains. In these cases the only course is to enlarge and improve these channels so that they can carry the run-off from their particular catchment area to the sea.

#### Limits of Scheme

Royds said: “There are many hundreds of water channels in the proposed drainage area ranging in size from the ordinary small farm ditch to large main drains, and it is clear that some limit must be set to the obligations of the proposed Drainage Authority as regards construction and maintenance of drains within its area. It would not be reasonable to expect the Drainage Board to maintain farm ditches of purely local use.” The Drainage Board was formed by the Ashburton County Council.

Only those drains which in Royds' opinion would most effectively form an adequate framework on which a secondary system of internal farm drainage were selected to be improved or newly constructed and thereafter maintained by the board. Quite apart from the board's obligations to construct and maintain main drains it should have control over all watercourses, and new ditches should not be constructed without its authority.





February 22, 1945 Flood. Air Force photo. Ashburton—Hinds area. 14,000ha (34,000 acres) flooded.





1945 Flood. Air Force photo. Hinds Township.



## Design of Drains

Royds' view, which subsequent events have proved correct, was, that it would not be economical to design drains for abnormally heavy one day falls of nearly 125 mm (5 inches) as had occurred on two previous occasions and in these isolated conditions a certain amount of flooding would be inevitable. The object of the system is not so much to provide for maximum flood flows as to afford constant drainage over extended periods of high rainfall thereby maintaining conditions more able to cope with extra high precipitation if it occurs. The coefficients adopted give drain sizes reasonably able to meet this demand while being economically possible. The functions of the drains can be classified as follows:

1. To reduce groundwater in the areas requiring it.
2. To carry floodwaters as quickly as possible.
3. To transport water from both sources to an outlet.

## Depths

"Depths of drains to be 1 metre (3 ft.) to 1.5 metre (5 ft.) except in special cases as in times of drought there would be a tendency to lower the groundwater level of the land adjacent to drains too much." MacGillivray of the Agricultural Department who inspected the area with Royds also agreed on this point.

## Hinds River

"Unless the Hinds River is cleared of obstructions and the flood levels lowered appreciably some of the drainage outlet to that river may require flood gates. It is highly desirable to avoid these if possible."

## Aerial Survey

"It is very desirable that an aerial survey of the whole area and possibly some of the land outside the area should be undertaken as part of the scheme. This would be invaluable in finally deciding on drainage area and in showing accurately the position of water races, fences, swamps, old water courses that are almost obliterated by ploughing and so on. The aerial photographs properly mounted would be most useful during the planning and construction period and in defining drain catchments."

## Estimate of Cost

	A. South of Hinds River	B. Hinds River — Ash. River	Total
Hectares	11,396	27,455	38,851
	\$	\$	\$
Excavation	22,162	60,718	82,880
Structures, race offtakes, culverts	7,140	16,014	23,154
Clearing willows, access, fencing etc.	3,064	11,384	14,448
	32,366	88,116	120,482
Engineering and supervision at 5%	1,620	4,400	6,020
Estimated compensation	1,054	876	1,930
Aerial survey	88	562	650
Legal expenses and incidental say	200	500	700
Totals	35,328	94,454	129,782
General contingencies for rising prices etc.	2,600	7,400	10,000
Grand Total	37,928	101,854	139,782
Allow	38,000	102,000	140,000
	Block A	Block B	Total
Cost per Ha. improved	3.33	3.72	3.60

"The largest single item is of course excavation. This has been classified according to the conditions and different unit costs have been used for the different classes of machine work. A variation of one cent per cubic metre would make a large difference in the total and for this reason and because of the other indefinite factors a substantial contingency allowance has been added."

## Construction Programme

"Of the various drains proposed it would be easily possible to choose the most important cut-off drains to form the first programme of work. For instance Timaru Track, Wheatston, Mulligans and the Windermere cut-off drains would give partial relief to large areas contiguous to the rivers. They would not improve the central belt which requires important long drains such as the Parakono, Home Paddock and Windermere drains and their branches."

## CONCLUSION

In conclusion, Royds said that due to peculiar natural features and to neglect the drainage of a very large area of valuable land was in a chaotic condition.

"The serious consequences are evident even to a layman but it is for agriculturists to estimate the beneficial results that a comprehensive improvement scheme would bring about and to balance these results against the cost of improvement."

"Where the heavier land suffers from water logging it would be protected from excess groundwater from higher areas and in addition would be provided with convenient outlets for farm drains. Lands not permanently waterlogged but subject to periodical flooding would also be protected. In both cases farmers who co-operate by maintaining their farm drains could sow their crops with a reasonable expectation of immunity from major disasters such as have occurred in the past and there can be no doubt that increased production would be the result."

"In this respect the work could be considered of national importance."

## CHAPTER 6

### 1939 to Advent of South Canterbury Catchment Board – The War Years

Following receipt of Royds' report, the Ashburton County Council on December 21, 1939 wrote to the Minister of Public Works the Hon. R. Semple seeking an urgent inspection of the drainage area. The council wanted to discuss ways and means of having the necessary work taken in hand as much valuable land was reverting to its natural state. The council pointed out that increased primary production was urgently required and of great national benefit to the New Zealand war effort.

A reply was received from the Minister acknowledging receipt of the council's letter, Royds' report and plans and that he had called for a full report from his department relating to the Drainage Scheme and improvements to the Hinds river. This might take some time, said the Minister, but when a full report had been received he would be pleased to consider what measure of government assistance could be extended towards the scheme and that the council would be advised in due course.

The Minister inspected the drainage area in early February 1940, and the Ashburton County Council again wrote on May 17 and July 11, requesting advice on the government decision on assistance towards the cost of the proposed works and seeking a deputation to meet the Minister.

On July 28, Mr S. P. Taylor the chairman, and Cr H. C. B. Withell (representing the council) and Mr J. H. Grigg (representing the farmers) interviewed the Hon. R. Semple in Christchurch and impressed on him the urgent necessity of the proposal drainage works and the clearing of the Hinds river. The Minister was most sympathetic and expressed his appreciation of the urgency of the work and he instructed the District Engineer T. G. Beck, to confer with the engineering consultant H. G. Royds and to forward a report on the scheme, on the receipt of which he would approach Treasury and ascertain what contribution it would make.

Immediately following the visit of the deputation the Ashburton County Council wrote requesting the government to extend as liberal a subsidy as possible towards the cost of the work and submitted the following factors:

1. "The necessity for the work in the interests of national production, as large area of rich agricultural lands are deteriorating and becoming water logged because of the lack of outfall drains."
2. "The proposed work, when completed will not be the full cost, as land occupiers must then bear the additional cost of opening the necessary subsidiary drains through their respective properties."
3. "At least 5,250 ha (13,000 acres) of land of a value of \$412,000 (£206,000) belonging to or mortgaged to the Crown is within the area affected and much of it will benefit to the fullest extent by the work."
4. "The necessity of outlet channels for surplus irrigation water. These drains when completed, will act as irrigation channels the cost of which will undoubtedly be reduced on account of the drainage scheme under review."

The council also pointed out that there were a number of localities where the construction of cut-offs to the Hinds river would, in flood time, divert surface water and prevent serious overflow on farm lands and asking the Public Works Department to undertake the cut-offs urgently as part of Government contribution to the scheme. The council also requested the highest subsidy possible and that on receipt of government decision on subsidies a meeting of the settlers within the area will be held with the object of obtaining their consent to the raising of the necessary loan to cover the council's proportion of the cost.

Again on September 4, and October 10, the council wrote to the government expressing deep concern at the lack of action and stated that the settlers were very restless and that something should be done to permit them to increase their production in the national interest. The council also wrote to the District Engineer, P.W.D. Christchurch of their concern as to when the report would be made available and were advised by T. G. Beck that his report on the Ashburton-Hinds Drainage Scheme had just been forwarded to the P.W.D. Wellington and that the matter was now in their hands and that the report on the Hinds River Control was held up through shortage of staff competent to make the necessary flood computations. He expected to report on the Hinds River in a few weeks.

The Canterbury Progress League wrote to the A.C.C. on August 21, 1941 offering assistance and three days later the council wrote to the League saying there was a hold-up in the government departments to the basis of allocation of cost and the "ridiculous suggestion" had now been made that the allocation be: "Government one-third; ratepayers one-third; council one-third and that as soon as all particulars were available these would be submitted to the League whose assistance would be most valuable."



On September 10, the progress League wrote to the Hon. H. T. Armstrong, Minister of Public Works.

"In the opinion of its members, it is highly important that no delay should occur in providing effective drainage for this area, as the introduction of irrigation on the lands higher up would undoubtedly tend to increase the seepage difficulties and give rise to a considerable amount of trouble and of public indignation.

"As you know, the League has been a keen supporter and advocate of irrigation in this district and did much by way of experimentation to prove its suitability under Canterbury conditions. Throughout the whole of our connection with these experiments we have found some members of the farming community rather sceptical and at times opposed to irrigation, but we have put this down to lack of knowledge more than anything else. This is borne out by the fact that many farmers who were once opposed to irrigation are now numbered amongst its firm supporters."

"You can readily understand, however, that any trouble at this stage, such as might arise from lack of drainage in the lower levels to deal with the seepage of water from irrigation, higher up would have serious repercussions, not only in the particular district directly concerned, but in other parts of the country as well."

"For the reasons given, we feel strongly that every effort should be made to iron out any differences that may exist between the Ashburton County Council and your department regarding the financial arrangements for the drainage scheme in the Ashburton-Hinds area.

"In these conditions we think the department can afford to take a more generous view of the position than would be justified under ordinary circumstances, and we trust that the department will view the matter in this light. That is our considered attitude and we think it is a reasonable one in the circumstances as we see them from an unbiased point of view. In conclusion we can only express the hope that finality will not be long delayed."

In another long letter to the Minister dated September 18, 1941 the county council expressed concern about the 67.6 km (42 miles) irrigation channel across the foothills which was under construction at that time with the object of providing 28.3 cumecs (1000 cusecs) of Rangitata River water for irrigation and to develop 25,000 kw of electricity at Highbank on the south bank of the Rakaia river.

The council wrote:

"This canal will carry a huge quantity of water which will flow almost continuously and it is feared that the water will soak through the loose shingly soil, augment the underground flow of water from the mountains, and cause intensive flooding of the low lying heavy land in the area near the sea and between the Ashburton and the Hinds rivers. Water will also flow in the subsidiary channels carrying water for irrigation and will create further difficulty."

"In their fear that the turning on of water into the canal would bring desolation and ruin to their district and put out of production a large area of heavy land which produces wheat, grass seed, fat lambs and dairy produce, the farmers of the area met the Hon. Mr Armstrong and the Hon. R. Semple and discussed the problem with them. The Ministers fully appreciated the difficulties which confronted the farmers and gave an assurance that the area would be adequately drained before water is turned into the canal. This assurance was accepted with relief and with confidence that the drainage work will be undertaken.

"The matter of allocation of the cost is now an obstacle to the commencement of the work, and with the view of an agreement in this respect and because of the urgency of the work before irrigation water is turned on we desire to meet you and submit the following factors:

1. "Adequate drainage is essential and should be undertaken before the water is turned on in accordance with the undertaking of the Minister.
2. "The drainage district will gain no advantage or profit from irrigation, or from the development of electric power.
3. "The drainage system will be of advantage to the Government in the disposal of surplus irrigation water, for which provision has probably been made on the estimates.
4. "An area of 5250 ha (13,000 acres) of Crown land or land mortgaged to the Crown, of a capital value of \$411,902 (£205,951) is within the area.
5. "The heavy additional cost which will confront farmers in the excavation of subsidiary drains on their respective properties to connect with the main drains.
6. "The heavy cost of future maintenance of the main drains which will be undertaken by the Council and the cost of maintenance of subsidiary drains by the farmers.
7. "The necessity of conserving and improving the present resources of the Dominion, and of increasing our primary production to the utmost in order that we may be better able to provide for the post-war demand for foodstuffs for a starving famine stricken Europe.

"For these reasons the council and the farmers of the district are of the opinion that the full cost of the work as an incidental to the development of electric power and of irrigation."

"As, however, a drainage scheme will be of advantage to the district, and in order that the work may be pushed on and completed in readiness for the turning of water into the canal, we are of the opinion that a grant of 3 for 1 would be a reasonable basis on which to work."

"Some 12 months will elapse until the necessary legal steps can be finalised, the area classified, a poll of ratepayers taken and tenders called for the work. Meanwhile repeated floods cause difficulty and loss and unfortunately the drainage scheme cannot be efficient until the Hinds river into which much of the water discharges has been cleared of obstructions and willows."



"In view of the danger of seepage through the very light shingly soil of this country, it would be greatly appreciated if the Government would defer any irrigation proposals in this particular locality until the effect of the application of water on other areas of the county is ascertained. We feel that if water is turned on in this locality, the lower lands, where drainage is already a problem will be inundated."

At about this time the possibility arose of the drainage scheme receiving a serious setback. This came in a letter by the Minister of Public Works Mr R. Semple, to the Canterbury Progress League. The League had written to the minister in support of the scheme.

In his reply dated September 10, Mr Semple enlarged the matter, which had previously involved the amount of subsidy available, to cast doubt on whether the scheme would be gone ahead with before the end of the war.

The county council was alarmed at this possible delay and through the member of Parliament for Ashburton Mr T. D. Burnett sought an urgent meeting to discuss the development.

This resulted in a deputation from the county council waiting on the Minister of Finance, Mr Nash, Public Works, Mr Armstrong and Agriculture Mr Barclay on September 25, 1941. The deputation was led by the County Chm. Mr S. P. Taylor, Cr. Frampton, County Clerk Mr G. Kelly and Messrs. J. H. Grigg, G. H. B. Lill and J. Cocks representing the farming community. The deputation emphasised the urgency of the proposed works and detailed the seven points which had earlier been the subject of written submissions.

Reporting to the council on the meeting with the three ministers, Mr Taylor said that the Minister of Public Works (the Hon. H. G. Armstrong) had agreed that he had given an assurance that the drainage would be completed before irrigation water is turned on, and also that he had led the settlers to believe that the Government would be a little more liberal than the subsidy which had been suggested, 1 for 2, although he was of the opinion that a substantial contribution should be made by the settlers whose land would be improved considerably.

Furthermore, the Minister of Agriculture (the Hon. J. G. Barclay) had commented on the low rates over the district compared with rates of 2.5 to 3 cents in the \$ (5d to 6d in the £) in his district, and that drainage appeared to be necessary apart from irrigation.

The Minister of Finance (the Hon. Walter Nash) stated that he realised the necessity of maintaining production, but the question arose as to whether the owner of the land to whom most benefit would accrue or the general public should bear the cost, and in what proportion. He felt that the owners should contribute two-thirds and the government one-third. The settlers, however, asked for two-thirds from the government, and Mr Armstrong had suggested a 50-50 basis. He stated he would accept Mr Armstrong's suggestion and offer 1 for 1 and get on with the job as quickly as possible without further argument. He agreed that the problem of the Hinds river should be dealt with separately, and requested Mr Armstrong to make an inspection of the river and endeavour to hasten the completion of the report and estimates of cost of this work.

Mr Taylor, reporting to the council on the deputation said:

"Although the subsidy offered was lower than expected, I must express my appreciation of the very courteous way in which the Ministers of the Crown met the deputation, and of the interest they evinced in the whole problem. Mr Armstrong particularly was very helpful and fully acknowledged the assurances given by him at Ashburton recently. He willingly consented to visit Ashburton again at an early date and discuss the Hinds river problem. As the clearing of the river is necessary to provide an outlet for water from the proposed cut-offs and drains we pressed for an early completion of the report and estimates of costs of this work. A decision must now be arrived at as to the acceptance or rejection of the government's offer which appears to be final."

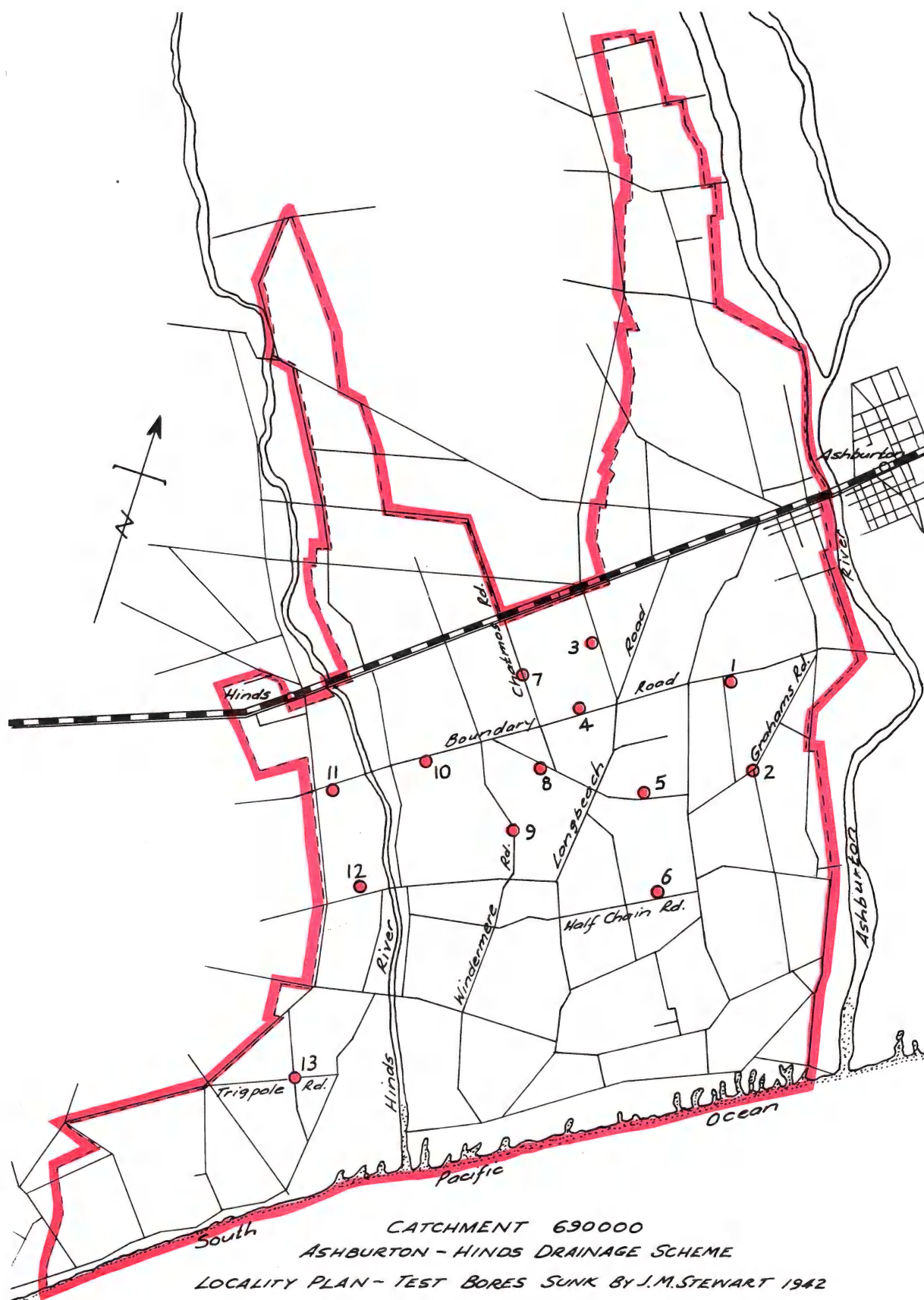
One day after the deputation was received, H. G. Royds in a letter of September 26, 1941, reported to the council that he had visited the Ashburton-Hinds drainage area in company with Mr H. A. Vezey the County engineer and had noted the very waterlogged state of a large part of the area and reported to council as follows:

"It seems clear that the rise of the ground water level is caused by the presence of an impervious stratum, or may be more than one, which would appear to extend across the area somewhere below the main highway. The location and depth of this may have an important bearing on the depth and layout of drains in that area and I consider that an investigation under the following headings would be very useful:

- A. "A systematic recording of ground water levels in gravel pits and wells throughout the area.
- B. "An Investigation of the numerous springs which exist i.e. their location and the volume of water flowing from them.
- C. "A system of trial bores to find out as far as possible the depth and location of hard pan or impervious ground.

"On making enquiries we found that the Public Works Department with the primary object of investigating seepage had already commenced investigations under the first two headings i.e. groundwater level and springs. My suggestion now is that your Council should consider having some test bores put down to find out the nature of the ground. This to my mind is even more important than the other two matters. I have discussed this with the District Engineer, P.W.D. who is in agreement with me and states that his department would willingly pool the results of its investigations with those of the council. The depth would be decided by what is revealed by the first few bores but basing them on 7.6 m (25 ft) average. The cost would be about \$32 (£16) each. The greater the number of these bores the better. I should say that six would be a minimum but preferably a dozen, which would cost about \$400 (£200).

The council adopted Mr Royds recommendation and agreed that 12 bores be sunk.



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Figure 5



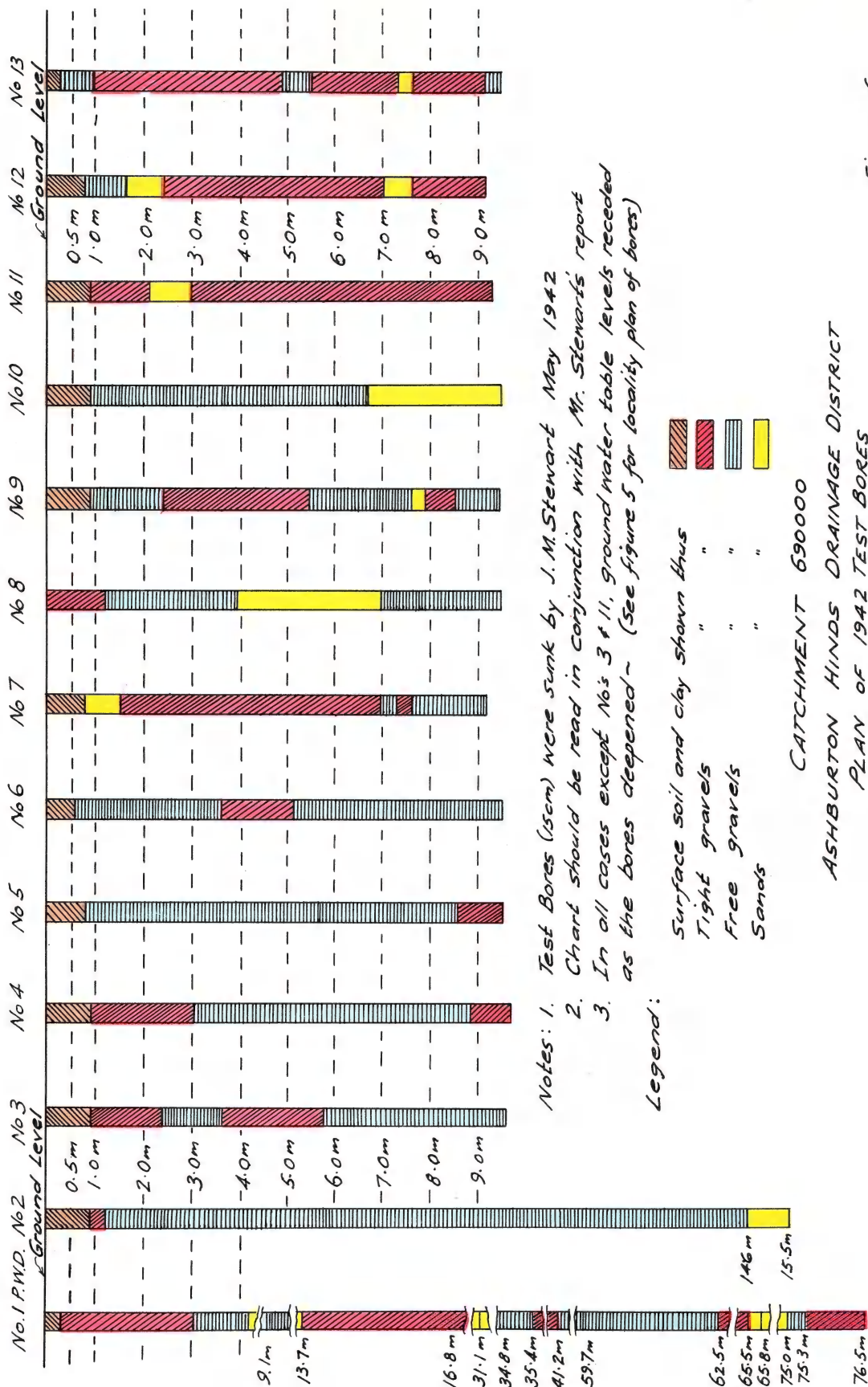


Figure 6

At the beginning of 1942 the county again wrote to H. G. Royds asking him to go ahead as soon as possible with the classification of the Ashburton-Hinds drainage area. The county also agreed to Royds' request for the assistance of Mr Albert Freeman of Christchurch to assist jointly on the classification.

The county council reported on May 26, 1942, on progress on the drainage scheme. This was in response to a letter from the progress league.

The letter said:

"After protracted negotiations the government offered to contribute half the cost of this work estimated at \$168,000 (£84,000) and the council after conferring with ratepayers of the area, has accepted the offer. The necessary legal steps are now under way for the constitution of the area as a drainage district, a majority of ratepayers having signed a petition to that effect. The classification of the land is also under way, and is being done by Messrs H. G. Royds and A. Freeman of Christchurch. Defence works have naturally interfered with the commencement of the work, and it cannot be expected that a start will be made, as far as the actual work is concerned, until after the war."

Reporting in May, 1942, on the results of the test bores, Mr J. M. Stewart said "An examination had also been made of gravel pits in the drainage area and it had been noted that surface soil and clay did not in general extend beyond one metre (3 ft)."

Interpreting the test bores, he wrote:

"It is to be noted on the plan that the numbers do not correspond with each other, by reason of shifting and camping facilities having been given precedence over order of rotation and it may also be noted that with the exception of bores No. 3 and No. 11 the ground water table levels receded as the bores deepened. Doubtless these two exceptions would have shown similar results had they been sunk deeper than arranged for. This is very interesting and indicates that the same conditions exist over a wider area than that tested, and that the surface streams are held at a high level by reason of a clayey substance adhering to the gravels which forms a partial impervious matrix verging on semi-conglomerate.

"This matrix formation varies considerably in thickness and depths, and surface springs appear wherever these formations rise close to the surface, this being the natural outlet from undersurface depressions and undulations which form the bed on which these water-flows move forward to their outlet. The test bores show that the surface flows cannot descend to a common hydraulic gradient, common to porous gravel formations, but that an escapement downwards does take place wherever the formation is favourable, the receding water-table levels as the bores deepen, is sufficient to prove that contention."

"Further proof of the porosity of the gravel beds at depths has recently been obtained by the sinking of a 15 cm (6 in) test bore to 76 metre (250 ft) level at Willowby for the Public Works Department, which showed a porous layer capable of considerable absorption between 50 and 60 m (160 and 200 ft) levels having a water-table level 3.7 metres (12 ft) below that of surface ground waters. The indications are, therefore, that the whole area contains a high level, slightly undulating, nearly (but not quite) impervious bed, over which the major portion of water flows from the higher back country, traverses towards the sea in the fluctuating quantities, proportionate to previous rainfalls and emerging as springs in depressions, or otherwise, at the feather edges of the upper porous gravels, which thicken backwards towards the mountain ranges. It is clear, therefore, that the nature of the ground below the flow of the upper water seams does not lend itself to rapid percolation downwards, resulting in a multitude of springs on the surface which would be non-existent if the gravel beds underneath were consistently porous.

"On the evidence so far obtained it appears reasonable to presume that a 15 cm (6 inch) slotted pipe positioned between approximately 40 and 70 metres (160 and 230 ft) levels and slotted also from surface to 15 metre (50 ft) depth would take away something in the vicinity of 900 to 1400 litres (200 to 300 gls) per minute constant flow. Indeed, the absorption may even prove greater, but I consider it would be prudent to refrain from over estimating the quality at this stage of development. Of particular interest in this respect is the knowledge that with an open ended 15 cm (6 inch) pipe only, at Willowby, the descending waters washed away all fine sands surrounding the bottom of the casing positioned at 60 m (200 ft) level, and for a period of three months proved sufficiently effective to warrant a recommendation of a further trial with slotted pipe adjacent to some land which at present is suffering the disadvantage of an overdose of surface water.

"This recommendation must not be construed as something to take the place of a major drainage scheme, but rather for a scientific investigation where it is likely to do much good within the limits of its capacity to serve."

Although agreement on the overall scheme was far from being reached, pressure from farmers as far away as 19 km (12 miles) caused the county council to go ahead with the construction of one of the major drains in the proposed scheme. Late in 1942, Mulligans cut-off 1.17 km (58 chains) in length was constructed on the west side of Moronan Road and discharging into the Hinds River approximately 3.2 km (2 miles) upstream of Moronan bridge.

This work proved of great benefit, cutting off a natural stormwater course which fed Mulligans swamp. The cost was \$1300 (£650) including three farm bridges.

#### **ROYDS REVISED ESTIMATE**

There was little progress in the succeeding year. The next official mention was in August, 1944, when H. G. Royds reported to the Ashburton County Council that in order to bring the whole matter of the A.H.D.S. up to date the following additions should be taken in conjunction with his original report of November 27, 1939.

#### **"Revision to scheme**

From time to time since the date of the original report, meetings of land owners have been held and some good suggestions for improvements to the scheme made.



"Furthermore during 1943 in collaboration with Mr Albert Freeman, Valuer of Christchurch I carried out the classification under the Drainage Act of all the lands affected by the scheme. This necessitated several months of detailed investigation of the whole area. In order to classify the land as to the degree of improvement due to the scheme we had to discuss their drainage problems with a large number of individual farmers all over the district and in the course of these discussions further possible improvements became evident."

"In consequence of all this the scheme has been revised and now represents the results of very intensive investigation extending over several years." Mr Royds wrote "I will now deal in turn with the subjects in the original report which require comment due to this revision."

#### **"Surveys**

Since the original surveys were made aerial photographs of the area have been taken. These proved to be invaluable and facilitated the final planning of the scheme.

#### **"Plans**

The plans have now been revised and brought up to date.

#### **"Present Conditions**

As a result of nearly five years during which hardly anything has been done in the way of maintenance of drains the conditions described in the original report have of course been aggravated.

#### **"Area Affected**

After discussions with various interested people it was decided that money spent on drains across light plains country such as Fountains road drain and Poplar road drain, would be spent to better advantage in the wetter areas. The light plains lands are only in exceptionally bad seasons such as 1938 injuriously affected by lack of drainage and furthermore it is doubtful whether cut-off drains in the light country would in fact have had much effect in cutting the water from the heavier land below. Accordingly some of the drains in the light land have been deleted and approximately the same quantity of excavation in drains has been substituted in the wetter areas such as Chatmos and Lowcliffe. Nearly all the reduction of 7,200 hectares (17,800 acres) from the original 39,000 ha (96,000 acres) is accounted for by light plains country. The drainage area is now 31,640 ha (78,200 ac).

#### **"Hinds River Improvements**

I understand that this scheme has not yet been completely designed by the Public Works Department. I hope the department will collaborate with your council in the matter, especially as regards the lowering of the flood water level in the river to facilitate drainage into it.

#### **"Design of Drains**

During 1942 your council had 12 test bores put down by a well-sinker in order to discover the nature of the ground at different places. The result of these bores will be useful in designing the drains. At the same time I have been unable to find much consistency in the ground characteristics from these bores and think that the design of each drain will have to be considered from a local investigation.

#### **"Depth of Drains**

This is a point that requires further elaboration, the remarks in the original report being perhaps of too general a nature. The ground has been found to have such varying qualities that the depth of individual drains will have to be decided to suit local conditions when the final survey is made. It has been known that there are extensive areas served by tiled drains, the outlets of which have become blocked but recently other such drains not known of previously have been discovered. It is a first principle that drains must be deep enough to take the water from all these old tiled drains and the final survey will have to include a thorough search for them. No doubt the farmers will come forward with any information they have when the time comes.

#### **"Estimate of Cost**

My revised estimate of February, 1944, is substituted below for the original estimate. Originally the total area was subdivided into two blocks but I am now treating it as one. The increased cost of \$52,000 (£26,000) on the original figure is brought about chiefly by inflated prices due to war conditions.

#### **"Revised Estimate of Cost February 1944**

	\$	
Excavation, new, and enlarge old drains	110,286	
Structures, farm bridges, race offtakes, culverts, structures	40,934	
Clearing willows, erosion protection and sundry works	20,340	171,560
Engineering, supervision at 5% \$8,578 compensation, legal expenses	2,800	182,938
General contingency, say	9,000	191,938
Allow		\$192,000

"The cost per ha. improved is now \$6.05 (£1-4-6 acre) but it should be pointed out that quite apart from increased costs the average improvement will be greater due to the revisions of the scheme mentioned previously.

## **“Government Approval of Scheme**

As there have been changes in the personnel of the Public Works Department I should mention that the District Engineer at that time Mr T. G. Beck examined and approved of the scheme from a technical point of view in 1940.”

An interesting side light occurred early in September 1944, when Mr R. D. Robinson who farmed in the Fords road — Boundary road area and later to become a member of the South Canterbury Catchment Board, without approval of the council excavated a large drain on the west side of Boundary road and illegally lowered a culvert crossing the road which is known today as Maginness’s drain culvert.

Mr Robinson wrote expressing regret for his action and the council in accepting his apology decided to take no further action.

In the first week of October, 1944, the next statutory steps were taken towards bringing the drainage scheme into operation.

Three resolutions were carried by the county council at a meeting on October 6, 1944. These were:

1. “That pursuant to Section 173 of the Counties Act, 1920, the Classification List of the Ashburton—Hinds Drainage District, including the Tinwald Town District, as prepared by Messrs H. G. Royds, and A. Freeman, be, and is, hereby approved and that the seal of the County be affixed thereto by the Chairman and the Clerk.
2. “That the rate to be imposed upon the several classes of land within the Ashburton—Hinds Drainage District for the purpose of paying interest and sinking-fund on the loan to be raised to pay the cost of drainage work in that area, and for maintenance costs thereon, shall be in the following proportions:  

Class A	Six parts
Class B	Four parts
Class C	One part
3. “That the Council apply to the Local Government Loans Board for its sanction to borrow the sum of \$96,000 (£48,000) for the purpose of providing the Council's share of the work of drainage within the Ashburton—Hinds Drainage District. It is proposed that the loan shall be for a term of 25 years with interest not exceeding 3½ per cent, the security of the loan being a rate on a graduated scale of the Capital Value of all lands within classes A, B and C of the Ashburton—Hinds Drainage District, averaging 0.21c in the \$ (0.5d in the £) over the whole area.

## **ASHBURTON—HINDS DRAINAGE SCHEME — CLASSIFICATION**

Seventy-four objections to the classification were heard by a magistrate between October 24, and October 27, 1944. 41 objections were dismissed and decisions on 33 were deferred by the magistrate till the following week. Of the 33 remaining appeals 24 were found to have been fairly classified and nine were amended to allow for variations within the classes.

Eight months before the objections to the scheme classifications were heard the government established a statutory body which was to play a vitally important role in the Ashburton—Hinds Drainage Scheme.

This body was the South Canterbury Catchment Board which was constituted by Order in Council on February 10, 1944.

The first board members elected were:

Dr P. R. Woodhouse, Chairman.

Messrs. M. S. Turton, R. Buick (representing Ashburton County), J. R. A. Hawkrigde, L. V. Talbot, W. H. Hall, R. G. Clelland, H. G. Kemp (representing Ashburton Borough), J. F. D. Jeune, W. H. Joliffe, J. D. Raeside, T. S. McMillan, W. C. Stafford, J. O. Riddell.

At this meeting three committees were set up and the elected chairmen were:

Finance: Dr P. R. Woodhouse, Rivers Control and Drainage: H. G. Kemp, Soil Conservation: J. F. D. Jeune.

Board members representing the Ashburton County and Ashburton Borough since the Board was constituted to date 1978 are as follows:

Year	Ashburton County	Ashburton Borough
1945/46	R. Buick, M. S. Turton	H. G. Kemp
1946/47	R. Buick, S. P. Taylor	H. G. Kemp
1947/50	R. Buick, R. D. Robinson	H. G. Kemp
1950	R. Buick, S. H. Lill	J. Cameron
1954	R. Buick, S. H. Lill	H. N. Armstrong
1956/57	R. Buick, T. P. Lowe	E. C. Bathurst
1959/60	G. A. Rountree, T. P. Lowe	E. W. Wilkinson
1962/71	G. A. Rountree, T. P. Lowe	G. Glassey
1971/74	G. A. Rountree, T. P. Lowe	A. R. Taylor
1975/77	G. A. Rountree, R. P. Davidson	A. R. Taylor
1977/78	G. A. Rountree, S. J. Morrow	A. R. Taylor

## **A Modified Scheme**

With the classification objections dealt with, the county council proceeded with the legal moves necessary to getting the scheme under way.



The council wrote to the board on November 6, 1944 as follows:

"The council has made application to the Local Government Loans Board for its sanction to raise a loan of \$96,000 (£48,000) being the Council's share of the cost of the above work, the total cost of which is estimated at \$192,000 (£96,000), and will be subsidised on a \$1 for \$1 basis by the Government.

"An area of 31,640 ha (78,200 acres) has been declared a Drainage District under section 168 of the Counties Act 1920 and the area has been classified by Messrs H. G. Royds and A. Freeman.

"The proposed term of the loan is 25 years and the estimated annual cost for interest and sinking fund is:

Interest at $3\frac{1}{2}\%$	
Sinking Fund $2\frac{1}{2}\%$	
6%	= \$5,760
Plus 10%	<u>576</u>
	\$6,336

"The values of the various classes is:

A	\$ 958,680
B	635,680
C	817,670
D	1,142,460

"The rate to be imposed on the various classes is:

A	0.50 cents in the \$	(one penny in the £)
B	0.33 cents in the \$	( $\frac{2}{3}$ penny in the £)
C	0.03 cents in the \$	( $\frac{1}{16}$ penny in the £)

Total rate \$6238.11 (£3164-1-1) A poll of ratepayers will be necessary.

"I am now directed by the council to make application to your board, under Section 143 (3) of the Soil Conservation and Rivers Control Act, 1941 for its approval of the proposed drainage works. Enclosed herewith a copy of Mr Royds report."

But the board had its own views on the scope of the scheme and the likelihood of it being rejected if a loan poll was held. Following the next board meeting the board's secretary replied to the county council as follows:

"My board is in receipt of your letter of November 6, 1944, applying for approval of the A. H. Drainage works.

"This matter has been considered by the Rivers Control and Drainage Committee whose report came before the recent meeting of the Board.

"The opinions expressed by the Ashburton members suggest that the ratepayers, while desiring improved drainage, would not sanction the proposed scheme on account of its size and cost.

"I have therefore been directed to advise you that while the board does not withhold approval of the scheme, it would draw your Council's attention to the fact that there seems every possibility of the loan poll not being carried, and the board suggests that the council give consideration to the substitution of a modified scheme."

The county replied thanking the board for its letter conveying recommendations in accordance with the proposed work and inviting representatives of the board to a meeting with council. Mr H. G. Royds who designed the scheme would be present. This was held in the council chambers on December 15, 1944. Mr H. G. Kemp, chairman of the Rivers and Drainage Committee represented the Board at the meeting.

Following this meeting Royds wrote to the council thus:

"I feel that I did not explain my ideas with regard to cutting down the above scheme very clearly at the meeting on Friday. In fact, I had expected that more time would have been allowed for examination of the problem when further points would have come out. However the following notes will summarise the position as I see it and may be of use to Mr Taylor and others interested.

1. "The present scheme is the result of modifications, deletions and additions made after numerous consultations with the ratepayers themselves. There are no superfluous drains — in fact there are not enough in some districts.
2. "The high cost is due to war conditions. It was not thought excessive at \$140,000 (£70,000) before the war with 50-50 subsidy.
3. "There seems to be an impression that the drains planned are too big and are more in the nature of flood channels to deal with all possible conditions. As pointed out in the report this is not so. They are designed as drains according to conventional methods. They would not cope with for instance the recent 125 mm (5 inches) of rain in 24 hours if this had come at the end of a wet spell.
4. "Any reduction of size will still leave a margin of safety.
5. "There is also an impression that cut-off drains like Timaru Track are all that is needed. Apart from the fact that cut-offs into the rivers will not improve the central area, or Coldstream at all. The catchment area below them is bigger than above and drains must be provided for this also.
6. "I do not think that value for money would be received in tackling the whole job under present prices and conditions and would advise the council against it.

7. "The ratepayers must realise that they are suffering due to at least 50 years of neglect of drains and rivers and are faced with several major schemes simultaneously to correct a position which with reasonable maintenance and care in the past would not have arisen.
8. "I therefore agree that to ease the immediate burden the drainage problem should be undertaken in stages if possible.
9. "This introduces technical complications and it must be kept in mind that the original scheme has been agreed to technically by the P.W.D. engineers and modifications must be to their approval.

Mr Royds concluded: "The area presents peculiar problems in relation to the technical design of drains as to size. While the principles I adopted for the scheme have been approved by the P.W.D. engineers I think that further discussions with the technical advisors of the Catchment Board or the Soil Conservation Council might lead to their agreement to the reduction of the drainage coefficient and/or catchment areas with a view to arriving at a lower cost even though it means a lesser degree of protection. The first step is for the Council to fix a maximum capital cost. I suggest that you pass these remarks on to anyone interested as giving more complete information than I was able to give to the meeting."

At the request of the council Mr Royds submitted alternatives to the main scheme as a way of reducing costs. These were:

1. "The improving of existing drains where necessary as suggested by Mr Kemp and Mr Taylor (i.e. putting the drains back to their original size and depth.)
2. "Retaining the same number of drains as proposed in the main scheme but reducing the sizes and carrying capacities of the drains to 50 percentage of the original.
3. "A revised system of drains to give immediate limited relief to most of the area."

### Alternative Scheme No 3

"If an alternative scheme is desired I would recommend this one as being the most suitable for the following reasons:

- a. "It gives the same coverage, but with a smaller safety margin than the original scheme.
- b. "It lends itself to extension, if required later, more readily than the other alternatives.
- c. "A re-classification of the area would not be necessary.

"While it has been suggested that the drains be made 50 percentage of the size shown in the original proposals, they may vary to a certain extent as the depth will be governed partly by outlets to existing open and tile drains. The estimated cost of this alternative is \$140,000 (£70,000) but this is only approximate as further investigation will be necessary before an accurate estimate can be established.

"If this scheme was adopted, it would be advisable to build any permanent structures of such dimensions that they would not have to be replaced if it was later decided to enlarge the drains to the original proposed size. There would be very little reduction in maintenance on this alternative scheme as against that on the original scheme."

On July 3, 1945 at the Council Chambers the Drainage Committee with their consultant, H. G. Royds and a group of nine invited farmers from within the three ridings of the drainage area, met to discuss the modified scheme and a motion passed at a recent meeting of ratepayers, at Willowby Hall which was;

"That the existing drains as shown on Mr Royds' plan to be deepened to their original depth. That drains be made in Lowcliffe as per original proposal, except Poplar Road cut-off into the Hinds River. That the cut-offs into the Ashburton River be constructed. That no cut-offs be made into the Hinds River."

The County Chairman, Mr H. C. B. Withell, then requested Mr Royds to speak on the modified scheme.

Mr Royds stated that drainage work was urgently required as he had made an inspection of the area and found that it was in a worse condition than he had ever seen it.

The resolution called on him to discover some means of getting as much work as possible for the money available, but it was a difficult technical matter. He had conferred with Mr McKinnon, of the Public Works Department and Mr Kemp, of the South Canterbury Catchment Board. Mr McKinnon had expressed the opinion that the drains must go into gravel and low enough to connect with tile drains. The drains suggested were to be 1.2 m (4 ft) wide on the bottom and side slopes 1 to 1. This would take ground water and would take a proportion of flood water, and would mean larger drains than just deepening by 45 cm (18 inches).

Mr S. P. Taylor stated that 45 cm would be deep enough and that the land occupiers would then be prepared to take any spillover in floods.

Commenting on this H. G. Royds said it would be difficult to ascertain the original depth of drains, and Mr J. H. Grigg stated that some drains had silted up more than others. Mr C. W. Anderson thought that 45 cm would be about the average requirement.

Mr Royds said that although he felt that his original scheme was still right, it could be cut down by reducing the catchment areas. Drains could be reduced in design and size but would not afford so much protection.

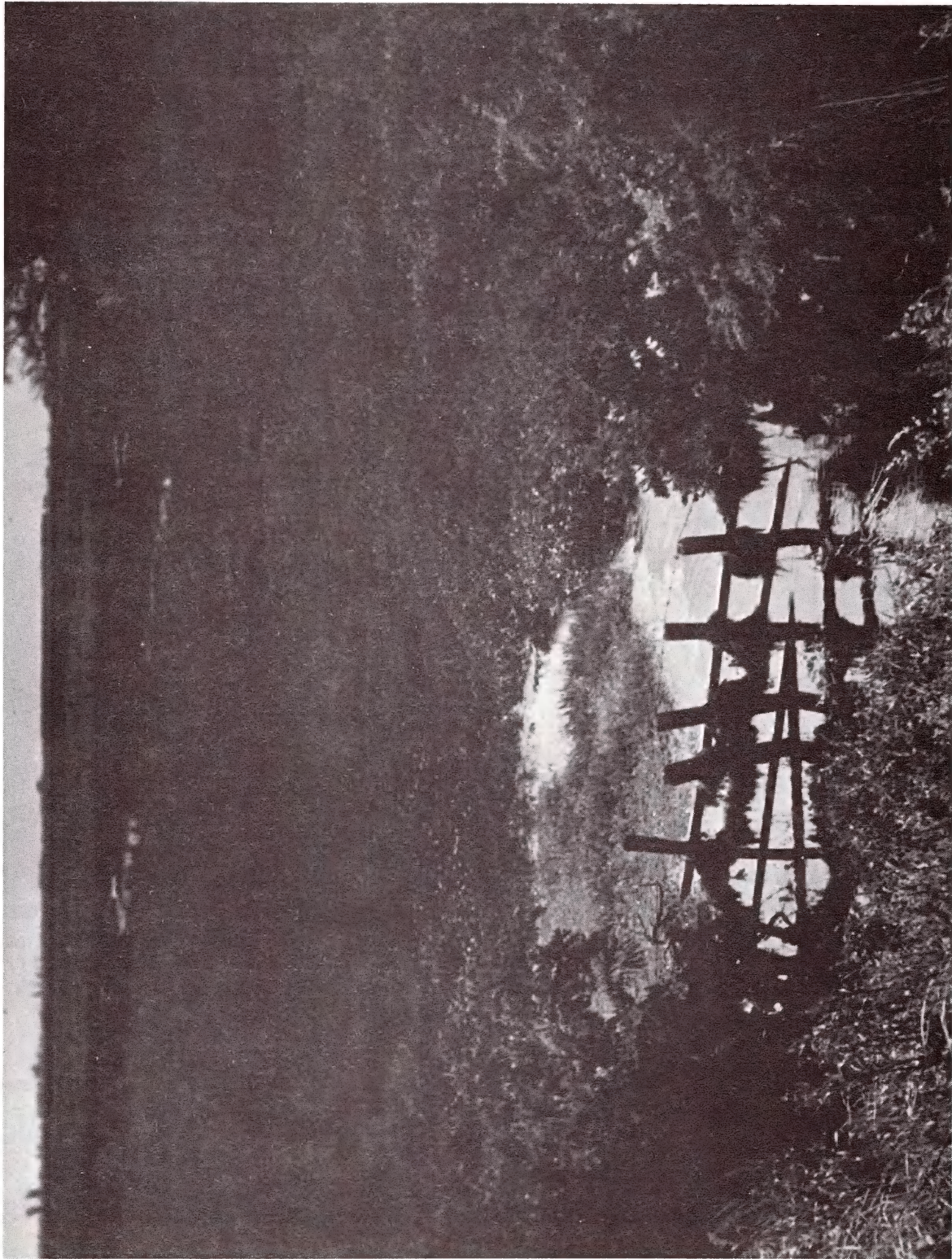
The matter of provision of bridges over the drains was discussed, and it was resolved that all bridges be the responsibility of the farmer and not of the scheme, except necessary bridges over new drains.





Home Paddock Drain, state of original drain 60cm (2') of water,  
view looking east from Boundary Road 14/12/45.





Parakanoi Drain at Boundary Road. View from culvert looking West. 14/12/45.  
Prior to excavation.



In reply to a question, Mr Royds said the existing classification would not be affected by the modified scheme.

Cr. J. Davidson stated that the drains in the Moronan area would not tap any springs significantly, and would not tap water from Mulligans swamp which flows east to Winslow. He said that his locality should be left out of the scheme and drains be not constructed. The settlers would be prepared to pay a proportion of the cost of Mulligan's cut-off.

Mr D. M. Bruce thought that the modified scheme was reasonable and Mr C. D. Chisnall stressed the necessity of the diversion of water near Hinds into the Hinds River to obviate the need for large drains to the sea. Mr Royds supported this contention.

After further discussion it was resolved that the original cut-offs into the Hinds River at Hinds and also the Windermere Cut-off be retained, although the Willowby meeting had not favoured cut-offs to the Hinds River.

It was also resolved:

"That Mr Royds' modified scheme, as explained by him, with smaller catchment areas and smaller drains, be approved and that he be requested to prepare an estimate of costs."

Cr. M. S. Turton expressed the opinion that as drainage work was urgently required, the catchment board would be compelled to carry it out at the expense of the area, if the land occupiers and the council failed to do so.

On July 19, 1945, the catchment board requested the chief engineer Mr G. R. Milward to write to the County about the Ashburton-Hinds Drainage Scheme.

Mr Milward wrote as follows:

"I understand that a considerable amount of investigation, surveying and preparation of plans has been carried out by Mr Royds, consulting engineer to the Ashburton-Hinds Drainage Board and it is assumed that your board will therefore be in possession of extensive records of drains, levels, catchment areas etc. . . .

"Such information would be of very great value to this board in exercising its functions under section 143 of the Soil Conservation and Rivers Control Act, and on behalf of this board I ask that copies of such records be supplied to me."

On the following day the county clerk wrote to Mr Milward:

"That all investigation and preparation of reports were held by Mr Royds in Christchurch and accordingly I sent him a copy of your letter in the hope that he will be able to supply you with what you require."

Later, Mr Royds handed over to Mr R. G. Drummond resident engineer of the catchment board (whose office was on the first floor of the National Mortgage and Agency Buildings, West and Tancred Streets Ashburton) all the plans, and data which represented all the original working plans, field notes and other data collected by Royds over six years and this proved to be most valuable to the catchment board.

### **WORSENING DRAINAGE CONDITIONS**

The five years prior to 1945 had witnessed the aggravation of the drainage conditions already described. Hitherto normal rainfall had minor effects only on the land surface. Conditions generally deteriorated to such a degree that almost every fall of rain registered its mark. In the 19 months preceeding the commencement of drainage work, six floods occurred which could not be accommodated by the drains. However the climax arrived during the year 1945 when almost double the normal local annual rainfall was experienced, there being, in addition, high intensities. Such abnormal rainfall also fell over the greater part of the Ashburton County and, although in places damage occurred it provided a huge reservoir of subterranean water in the upper catchment area, to the detriment of its area of emergence, east of the railway line in the vicinity of Boundary Road and the lands below.

### **THE TESTING OF THE RANGITATA DIVERSION RACE.**

#### **The Seepage Myth**

About this time occurred the testing by the Government's Irrigation Department of its extensive new scheme on the light plains country north and west of Ashburton. The source of its water was the Rangitata River to the west. Cutting horizontally across the head of the plain between the Rangitata and the Rakaia rivers was the 67.6 km (42 miles) long main diversion race 3 metres (10 ft) deep, 7.6 m, (25 ft) approximately in width with maximum capacity of 28.3 cumecs (1000 cusecs).

Numerous farmers blamed the irrigation scheme for the excess surface water in the Ashburton-Hinds drainage area and there developed the "myth" of irrigation "seepage". Doubtless some initial seepage did take place from this source and the lateral races, but with the sealing of the channel by the Public Works Department exhaustive experiments proved that only a negligible volume of water could have escaped underground.

Irrespective of the controversy over suspected seepage from the irrigation scheme, the Longbeach drains had become functionally inefficient, mainly caused by diffused management resulting in neglect of the system. This arose from the war-time shortage of farm labour (1939-1945) and the government policy of man power direction.

Even today within the drainage area "seepage" is considered a dirty word and has been more or less replaced with the more fashionable "groundwater".

## CHAPTER 7

### Ashburton—Hinds Drainage Scheme — A Reality at Last

#### H. G. KEMP — REPORTS TO BOARD — THE TURNING POINT

Mr H. G. Kemp A.M. Inst. C.E., A.M.I.E.E., M.N.Z.I.E., engineer-secretary to the Ashburton Power Board from 1923 to his retirement in 1960 was the first chairman of the South Canterbury Catchment Boards' Rivers and Drainage Committee and ably represented the board in discussion and meetings of interested parties prior to the appointment of the board's chief engineer Mr G. R. Milward.

Pete Kemp, or "Long Span Pete" as he was affectionately known by his staff, had a very sound knowledge of the drainage area having known the area intimately since 1923. Mr Kemp penned a letter of concern to Mr Milward on his appointment to the Board which resulted in a spate of letters thereby bringing about the required impetus to get the scheme started.

Mr Kemp wrote thus:

"The delay in getting remedial measures started in the Ashburton—Hinds area is causing me considerable concern.

"The land is, as you know, waterlogged and there is a large flow of spring water into it from the lighter lands above the railway, with the result that every rain causes considerable flooding. The recent rains caused much damage to roads and put much land under water.

"The present position is that the county council is awaiting a further report from its consulting engineer on a modified scheme. Assuming that this report is delivered in about a month, when it is due, the council then has to secure the sanction of the Loans Board and take a poll. I would estimate that it will be four to six months before it would be in a position to start work. In the meantime a very large area — in the order of 40,000 ha (100,000 acres) is very largely out of production of crops and apparently will be so for some time to come.

"I understand that contractors have been successful in securing draglines. The idea seems to be to use these on internal farm drainage. This of course, is quite wrong, as, in the deteriorated condition of the main drains, successful work on the higher farms will only increase the difficulty of those lower down. I doubt if the council is strong enough to stop this. If the machines are available they should be put to work on the main drains first."

"I suggest that you should, if the chairman approves, approach the Soil Conservation Council immediately with a proposal somewhat on the following lines and endeavour to obtain their feelings on the matter before our next meeting."

1. "That the Soil Conservation Council advance to the catchment board say \$10,000 to \$20,000 (£5,000 to £10,000) as part of future subsidies to permit an immediate start on the work."
2. "That the board guarantees that, should the subsequent Loan Proposal be turned down, it will recover half the amount expended to that time from rates — possibly it may be necessary to spread the rating over two or three years — on the properties benefitted."
3. "That the plans of the full scheme be finalised as soon as possible and put through the usual channels of Loan Board and poll."
4. "Should the Soil Conservation Council agree to such a proposal, our board should suggest to the county council that it hand over its drainage duties to our board forthwith. This can be done quite easily, as there is no rating on expenditure on works in hand at present."

"While I would not go so far as to say that the council has failed to function properly, I feel that their approach to the problem is far too slow. I understand that their consultant has stated that he cannot undertake supervision. The council has only one engineer at present and, even if a second one is secured, it is apparent that maintenance duties on roads and rivers will fully occupy their time for a considerable period. For these reasons I feel that the work could be much more expeditiously handled by the catchment board."

The board acted on Mr Kemp's recommendation and on August 23, 1945, G. R. Milward wrote to the Chairman of the Soil Conservation and Rivers Control Council on the Ashburton—Hinds Drainage Scheme.

"For some years the Ashburton County Council have been attempting to initiate a scheme to deal with the reconstruction of the rural drainage between the Hinds and Ashburton Rivers, the sea coast and the Main South Road. I understand that previous application has been made by the Ashburton County Council for subsidies and no doubt your department will be familiar with the details of the past history of the schemes.

"At the moment approximately 20,000 ha (50,000 acres) of some of the best producing land in Canterbury is water-logged, this being accentuated by the very wet season which has been experienced lately. Today the area is a sorry picture and this Board is very concerned at the delays that are taking place in formulating remedial measures."

"My chairman has directed me to make the following enquiry from you:"



"In the event of this catchment board taking the necessary steps under the Soil Conservation and Rivers Control Act to take control of the scheme and assuming that your council would approve this action, would your council be prepared to advance say \$20,000 (£10,000) for an immediate start on the work of deepening and clearing the main channels pending the completion of the surveys and financial arrangements."

"This board meets on Wednesday, August 29, and a telegraphic reply would be appreciated."

#### **PETITION FROM FARMERS TO BOARD — DRAINAGE URGENT**

Four days later on August 27, 1945 a petition was received from three farmers in the Eiffelton area, J. H. Grigg, J. Cocks and P. J. P. McQuilkin representing the McQuilkin estate. They expressed concern at the frustrating delays in implementing the Ashburton-Hinds Drainage Scheme and the Hinds River clearing, and requested the catchment board to take over these works with a view to their early completion.

Only one day later Mr Kemp in his capacity as chairman of the board's rivers and drainage committee acquainted other board members of the development under way. His August 28 letter read:

"Gentlemen, the delay in commencing remedial works on the Ashburton-Hinds Drainage Scheme has been causing me considerable concern. A large area of very valuable land is waterlogged and is generally unfit at present for cropping. In consequence, every heavy rain causes extensive flooding.

"The Ashburton County Council is awaiting a report on the modified scheme which was suggested by this board. On receipt of the report, the council then has to follow the usual procedure of making application to the loans board, taking a poll of ratepayers etc. before work can be started. It will probably be not less than six months and possibly up to 12 months before work can commence. The county also has much road work repair in hand and at present has only one engineer, but is endeavouring to get an assistant engineer.

"The Hinds River is closely involved in the drainage scheme and conditions in the river are far from good. A report on the river suggesting improvements, was prepared by the Public Works Department and submitted to the council, who, after consulting its ratepayers, has suggested a modification of the scheme to the P.W.D. and is awaiting a reply as to the amount of subsidy which will be available and also as to their proposal for a flat rate over the rating area.

"In the circumstances, I feel that the commencement of remedial measures on the drainage scheme might be expedited if the catchment board could take over the work, but action on the board's part would be dependent on funds being made available to it, and the only likely source of this seemed to be the Soil Conservation and Rivers Control Council. After consultation with the chairman, our engineer wrote to the council asking if finance could be arranged and he was promptly advised that S.C. & R.C. Council would provide funds for the current financial year.

"Subject only to staff being made available for surveys and control, and the obtaining of machinery, this board is in a position to start work at an early date on the drainage scheme. As soon as possible, complete proposals could be submitted to the loans board and the ratepayers share of the cost raised by loan either following a poll or by Special Order.

"No definite proposals are ready yet in regard to the Hinds River, but an early start on this work is urgent and, as several of the existing drains run into the Hinds, it appears necessary that the control of this work should be included with that of the drainage scheme.

"In view of the foregoing it appears desirable that the Ashburton County Council should be requested to hand over the control of the Ashburton-Hinds drainage and the Hinds River control schemes to the catchment board as soon as possible, and to this course I would not anticipate any serious opposition. The Ashburton County Council, as the local Rivers and Drainage Authority, has other works in hand or proposed, such as the Ashburton River maintenance, the completion of the Ashburton River control works and the Dry Creek diversion."

"The taking over of these now would place a heavy burden on the catchment board when its staffing arrangements are far from complete. It is possible, however that the council may desire to transfer all its river and drainage functions to this board, but the end of the financial year would be a more opportune time."

"Should the Ashburton County Council agree to the immediate transfer of the Ashburton-Hinds drainage and the Hinds River to this board, an assistant engineer, some staff, transport etc. will be immediately required, and very early action will be necessary to make these available. The cost of the staff would be a charge against the funds made available by the Soil Conservation and Rivers Control Council."

The catchment board maintained the impetus began by Mr Kemp, and a week later Dr P. R. Woodhouse the first chairman and first Finance Chairman of the South Canterbury Catchment Board wrote to the chairman of the Ashburton County Council on September 6, 1945;

"The catchment board has had certain urgent drainage problems in the Ashburton-Hinds district brought before it and desires to know the county council plans for dealing with the situation. The catchment board also desires to know the county council's views in regard to the future relationship of the county council to the catchment board in order that the board may plan its future requirements in staff, equipment and finance.

"In particular this catchment board desires to obtain from the county council, as the authority directly responsible, information concerning the council's plans for carrying out the following works:

"For immediate decision — Ashburton-Hinds Drainage  
Hinds River Control.

"For early decision — Ashburton River Maintenance.

"For future decision — Dry Creek Diversion.



The county council has been the controlling authority for rivers and land drainage in the county since 1936 and is still in direct control although catchment boards, which were established in 1944, have been given certain over-riding powers.

The Soil Conservation and Rivers Control Act imposes some restrictions on internal local authorities and requires the catchment board to take certain actions in regard to them. The Act also authorises catchment boards to take action in other directions if necessary.

"In order to comply with the Act a catchment board must:

1. "Supervise internal authorities in regard to river control and land drainage.
2. "Report to the Soil Conservation and Rivers Control Council on the advisability of altering or abolishing internal drainage or river districts.

"This report has not yet been submitted.

"The Act permits a catchment board to act if circumstances requires as follows:

1. "Give direction to internal local authorities.
2. "Exercise the powers of internal authorities after giving notice and in the absence of objection.

"The catchment board desires to know the views of the county council as to which authority is most suited, ultimately, to carry out works in the district. The amount of work undertaken will depend not only on its urgency, but also, to a large extent, on the funds obtained from rates and subsidies which can be made available.

"Ratepayers in the county have greater representation on the county council than on the catchment board, but any advantage that might accrue from this is quite overshadowed by the fact that subsidies are granted by the Soil Conservation and Rivers Control Council with which the catchment boards are in close contact because both were constituted under the same Act.

"The S.C. & R.C. council showed in a recent communication, in regards to large subsidies for work on the Orari River, that it is proposed to deal directly with the catchment board instead of the river board.

"At present there is a certain amount of dual control in regards to rivers and drainage in the county, but it is difficult to see how any form of dual control could be satisfactory permanently, because of the inefficiency and expense which would occur on account of the over-lapping authority.

"To simplify discussion it is suggested that after the engineering aspects have been placed before it, the county council expresses an opinion on the question.

"Does it appear desirable that the South Canterbury Catchment Board should exercise control of rivers and drainage matters in the Ashburton County?

"The catchment board has been faced with a similar position in regard to the Geraldine County River Board, but here arrangements were simplified by the Geraldine board taking the initiative and asking the catchment board to take over its functions.

"If the Ashburton County Council is of the opinion that it appears desirable that the South Canterbury Catchment Board should be given control, then the committee will place before the Council certain recommendations which, after discussion by the Council, it is prepared to place before the catchment board.

"If control by the catchment board is considered by the council to be undesirable then the committee asks for replies to the question enumerated earlier in this statement."

#### **CONTROL OF ASHBURTON-HINDS DRAINAGE SCHEME PASSES TO SOUTH CANTERBURY CATCHMENT BOARD**

At the monthly meeting of the South Canterbury Catchment Board held in the Levels County office, Timaru on October 4, 1945 the board discussed a letter from the Ashburton County Council advising that the council had consented to the control of river and drainage work in the county passing to the South Canterbury Catchment Board as from March 31, 1946, and stipulating certain conditions regarding water races, and preparatory costs incurred by the council in connection with Ashburton-Hinds Drainage Scheme; and also requesting the board to take urgent action with the Ashburton-Hinds Drainage Scheme and Hinds River control.

At this meeting on the motion of H. G. Kemp it was resolved by the board as follows:

1. "That the board take the necessary steps to take over the river control and drainage functions of the Ashburton County Council as from March 31, 1946.
2. "That in conformity with the request of the Ashburton County Council the board will assume control of the Ashburton-Hinds Drainage Scheme and Hinds River Control Scheme forthwith.
3. "That as far as is compatible with the Soil Conservation and Rivers Control Act 1941 the management of the water-race system, or such extension of same as may be decided on, shall remain with the Ashburton County Council.
4. "That the question of payment for engineering and classification services to Mr H. G. Royds, who was employed by the Ashburton County Council, be referred to the board's engineer for investigation and report."

A delegation from the board comprising Dr P. R. Woodhouse, Chm., Messrs H. G. Kemp, W. H. Hall, R. Buick and J. W. McKinnon inspected the proposed drainage area and had discussions with the Ashburton County Council in Ashburton, prior to the board meeting.





Crow's Drain. Original state south of Emerson's Road. 24/10/ 47.



Crow's Drain. Present state south of Emerson's Road. 1978





Boundary Drain, east of McLennon's Road, showing drainage conditions and area of rushes. 14/12/46.



Boundary Drain, east of McLennon's Road, showing present drainage conditions, note absence of rushes. 1978



The delegation's recommendations which were adopted unanimously by the board at its October 4, 1945, meeting:

"The County Council having now consented to the Catchment Board taking control of the river and drainage functions of the county, as from March 31, 1946, the delegates recommend to the board as follows:

- A. "That the Catchment Board report to the S.C. and R.C. Council the desirability of the Rivers Districts and Drainage Districts of the Ashburton County Council as from March 31, 1946.
- B. "That the Catchment Board proceed to establish a branch depot in Ashburton.
- C. "That the Catchment Board take action as follows in regard to certain works:

#### **1. Ashburton-Hinds Drainage**

- a. "That the catchment board negotiate immediately with contractors for the commencement of clearing the existing main drains of the Ashburton-Hinds drainage scheme.
- b. "That surveys and working plans for the drainage of the area be prepared and the present classification reviewed.
- c. "That, until the plans and classifications are completed and rate struck, the work should be financed by advance from the S.C. and R.C. Council in accordance with their telegram of August 25, 1945.

#### **2. Hinds River Control**

"That the engineer be instructed to prepare proposals for clearing the river of superfluous growth and to provide estimates of cost for dealing with the problems of this river, it being noted that many of the rate-payers affected are also affected by the drainage scheme.

#### **3. Ashburton River Maintenance**

"That the Ashburton County Council be instructed to attend to the maintenance of the Ashburton River and proceed to carry out such work as necessary to ensure that the capital expenditure incurred so far will not be partly wasted.

#### **4. Dry Creek**

"That attention be directed to this matter with a view to completing the proposals for dealing with the flooding problems."

### **A DEPOT IN ASHBURTON**

The first resident engineer of the board in Ashburton, Mr R. G. (Ron) Drummond occupied the position for only a few months before resigning in December, 1945 to take up an appointment with the Hawkes Bay catchment board. He was succeeded by Mr E. L. (Eddie) Robinson.

The first catchment board office in Ashburton was on the first floor in the old National Mortgage and Agency Buildings, West Street, now Brambles-Burnett Ltd., and the first depot was in the stables at the rear of the old Canterbury Co-operative Farmers Association Buildings, West Street, later occupied by the Ashburton Returned Services Assn.

A rental two-door Ford V8 Coupe was the only transport in 1945 and survey parties were taken to the site of a drainage survey by the engineer, and picked up by the same vehicle at a pre-determined ordinance map reference usually before 6 p.m. Early in 1946 H. G. Kemp arranged a light Ford truck from the power board which was hired out at 1.5c per kilometre (3d per mile) and with the speedometer out of order the mileage had to be estimated.

One of the early requirements of the Ashburton-Hinds drainage scheme was the formulation of drainage channel formula. The basis of design was generally for drainage channels to take 0.175 cumecs per square kilometre (16 cusecs per sq. mile) of catchment with provision at road bridges and culverts of approximately 0.437 cumecs per square kilometre (40 cusecs per sq. mile), while cut-off drains catered for 0.437 cumecs per square kilometre. Drain batters were 1 to 1 and most roadside drains  $\frac{1}{2}$  to 1.

The board kept a close watch on expenditure on the modified scheme and ensured that farmers were treated equally, a policy laid down that was to be strictly followed in all matters relating to the scheme. This had been well aired and discussed at several well attended meetings of rate-payers at Willowby in late 1945, and at Tinwald Town Hall, Hinds, Eiffelton, Lynnford and Lowcliffe meetings, the policy evolved was as follows:

- 1. That at least two months notice be given to farmers to clear trees and growth and to clean his drain to lower the water level to allow banks to firm for easier passage of dragline. If the farmer failed in this respect the dragline was to be transported to another drain.
- 2. That large willows and other trees which were beyond the resources of the farmer to remove would be the responsibility of the scheme.
- 3. That excavated material would be roughly spread by the dragline operator to enable the farmer to plough under, or levelled out by the board's angledozer as a charge to the scheme.

4. That all bridges, and/or culverts be the responsibility of the farmer concerned and not of the scheme except on new drains or cut-offs.
5. That if the farmer has the approved diameter concrete pipes at the culvert site these would be placed and back filled as a charge to the scheme. In the event that existing access pipes or bridges were too small these would be removed and a ford excavated in lieu thereof.
6. That only county water races systems would be reinstated as a charge to the scheme.
7. That if requested by the farmer while the dragline was on the property, stock drinking places would be made as a charge to the scheme.
8. That stock barriers across drains on fencelines are the responsibility of the farmer and are to be made and installed to the boards approved plan.
9. That the board holds itself responsible for the future maintenance of all drains and cut-off channels being undertaken in the scheme and the board intends to strike a maintenance rate to provide the funds required. It was subsequent on this statement (9) of policy that the subsidy was granted and the loan approved by the Soil Conservation and Rivers Control Council.

### **THE DRAINAGE EXCAVATION COMMENCES**

Six years after the drainage scheme was first proposed, the first work was begun. This was only three months after Mr Kemp suggested that the catchment board take over control of the proposed scheme.

On December 15, 1945, Burnetts Motors P. and H. dragline commenced the excavation of Timaru Track cut-off. Mr K. C. (Ken) Burgess operated the dragline and today is still associated with the same firm in an overseer's capacity.

The board had agreed that this should be the first construction work because of the need to reduce flooding in a very large area, including much of Tinwald, Flemington and Ashton near the coast.

J. L. (Jim) Frost operated the first catchment board machine, No. 5, an R.B. 10 dragline and commenced excavation of Windermere drain on J. H. Grigg's "Longbeach" property on March 4, 1946.

Soon there were seven draglines working on the Ashburton-Hinds drainage reconstruction, four Burnetts Motors, one McJorow Bros. and two catchment board draglines and by March 31, 1949, 257 km (159.8 mls) of the total 278 km (173 miles) of channel reconstruction was completed, comprising a total excavation to that date of 389,444 cub. metres (509,410 c. yds). The board purchased an Allis Chalmers H.D. 14 angledozer (ex Pacific Islands) No. 9 which commenced during 1946 clearance and tree removal where necessary and levelling out the dragline excavated spoil banks.

During March and June, 1948, delivery was taken of two additional 10 RB draglines No.'s 26 and 31. This was because the board's draglines operated more cheaply than contractors' machines.

In addition there had been continued requests from farmers for the release of contractors' plant so that internal farm drainage work could be done.

### **BRIDGES AND CULVERTS**

Two culverts were completed by tender in 1946. These were concrete box culverts on Shepherds Bush cut-off, Mill Road, Westerfield and Windermere drain, Windermere Road. Six new timber decked bridges were installed on county roads by the board's bridge gang. Twenty five concrete box culverts were underpinned to increase waterway capacity, lower ground water levels, and improve gradients. Altogether 67 bridges, culverts were built, lowered or underpinned.

The total cost of these structures was just over \$20,000 (£10,000) of which \$10,000 (£5,000) was subsidy. The board always considered these structures were improvements to country roading and that the country and the board should share this cost on a 50-50 basis. However, the county believed that each particular case should be considered individually and in the end the board settled for \$10,000 (£5,000) as the county share.

At the height of the drainage work there were 28 men employed on works in the Ashburton area. This included, an Ashburton river gang of six men and another of six men on the Hinds river clearance work which commenced in 1948.

### **ADDITIONAL DRAINS**

Mr R. D. Robinson who had been elected to the board in November 1947, submitted a list of 16 drains which he considered qualified for reconstruction as part of the scheme. The outcome of this request was that the board decided to advertise as follows:

"Any ratepayer who considers that he has not been given a satisfactory drainage outfall to a drain constructed, or reconstructed by the board under the Ashburton-Hinds Drainage Scheme is requested to notify in writing the Resident Engineer, Ashburton before March 31, 1949, so that any claim for additional drains in the area may be investigated."

The Ashburton resident engineer Mr J. S. (Jim) Houston received 30 written applications from various farmers in the drainage area who considered that they did not have an adequate drainage outlet and he later reported to the chief engineer Mr W. E. (Bill) Lucy that the investigations into the additional drains were completed and plans and recommendations were submitted for approval.



In his application for an extension of scheme drains and monetary authority to the District Commissioner of Works of June 10, 1952, Mr Lucy wrote:

"Work on the scheme was carried out through the years, 1946, 1947, 1948, 1949, 1950 against a background of ever rising labour, plant and material costs. Despite the spiralling prices, the bulk of the scheme was completed by the end of 1950 within the original estimate and there remained only a few very difficult drains to be located, financed, and constructed out of a small remaining monetary authority. Schemes for these are now prepared.

"However, for over a year now, it has been evident that a reasonably satisfactory and equitable drainage service cannot be given to some class A areas in the rating district until drains additional to the original scheme are constructed. The cases have been surveyed and proposals prepared in detail for most of them.

#### EXPENDITURE TO DATE I.E. JUNE 10, 1952

"The expenditure to date on the drains and cut-offs of Ashburton-Hinds Drainage Scheme is \$179,939.21 (£89,969-12-1) or \$14.79 (£7-7-11) less than the original 1946 estimate of \$179,954 (£89,977).

"Considering the general heavy rises in all costs during the years of construction, it would have been reasonable enough to expect the original estimate to be heavily overspent, rather than to find expenditure, as it is, to date actually within the old estimate.

"In connection with rising costs in such work the following ruling hourly wage rates of the period is of interest. In 1947 a foreman was paid 42c (4/2½) an operator 36c (3/7¼) a driver 35c (3/6¼) and a labourer 32c (3/2). Rates at date 1952 were respectively 60c (6/-) 52c (5/2½) 50c (5/0¼) and (4/9) the increase ranging from 41 to 50 per centum and trucking costs from 2c (4d) to 4c (9d) per km (1 mile). Machine costs rose by 43 to 49 centum in the period."

In July, 1952, the Soil Conservation and Rivers Control Council approved the expenditure of \$11,354 (£5,677) subsidy money to complete the extra 118.13 km (73.41 mls).

#### LENGTH OF SCHEME DRAINS

The additional drains were completed by 1955 to virtually complete the scheme which totalled 367.54 km (228.40 miles) of drains comprising a total excavation of 508,659 c. metres (665,348 c.yds).

Following the 1971 reclassification of A.H.D.S. drains for maintenance, 28.98 km (18 mls) were added and to date (1978) the scheme drains now total 396.52 km (246.40 mls).

#### A RELATED PROBLEM — LOWER HINDS RIVER CLEARANCE

An associated scheme closely related to the Ashburton-Hinds drainage scheme involved the clearing of the lower 27.36 km (17 miles) of the Hinds River, the alluvial and vegetative suffocation of which has already been mentioned. This work which cost \$24,000 (£12,000) was commenced in 1948 and completed two years later. The finance was raised by a grant of 3 for 1 subsidy by the S.C. and R.C. Council, the balance being raised by loan secured by a rate over a specially defined local benefit rating area.

The scheme constructed by board staff and plant along with hired plant consisted in the removal and clearance of unrestricted growth of willow trees from the bed of the river and gigantic, top heavy "old man" willows from the banks, the killing by hormones of obstructing vegetative cover of smaller willows, gorse and broom. Follow up annual programmes included the erection of flood overflow stopbanks.

The work has proved of great benefit to all concerned because of greatly improved drainage outlets to the Hinds River and elimination of scouring and bank erosion of drains by Hinds floodwaters which cause havoc and compounded the drainage problem before clearance. Prior to 1948, 14,000 ha (34,000 acres) of farmlands were periodically inundated.

With maintenance programmes being carried out annually since the completion of the initial clearance, the lower Hinds River is a credit to the board's maintenance policy. Along with the Upper Hinds River Catchment Control Scheme which was implemented in 1965 and already showing substantial improvements, the protection from flooding of adjacent farmlands and the Ashburton Hinds drainage scheme is assured.



•Windermere Drain at IM 4500'.





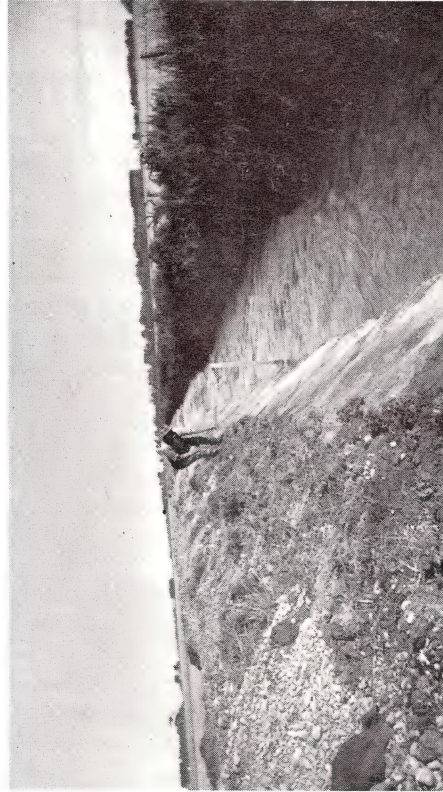
Flemington Drain at IM 3600' before re-construction.



Flemington Drain at IM 3600' after re-construction.

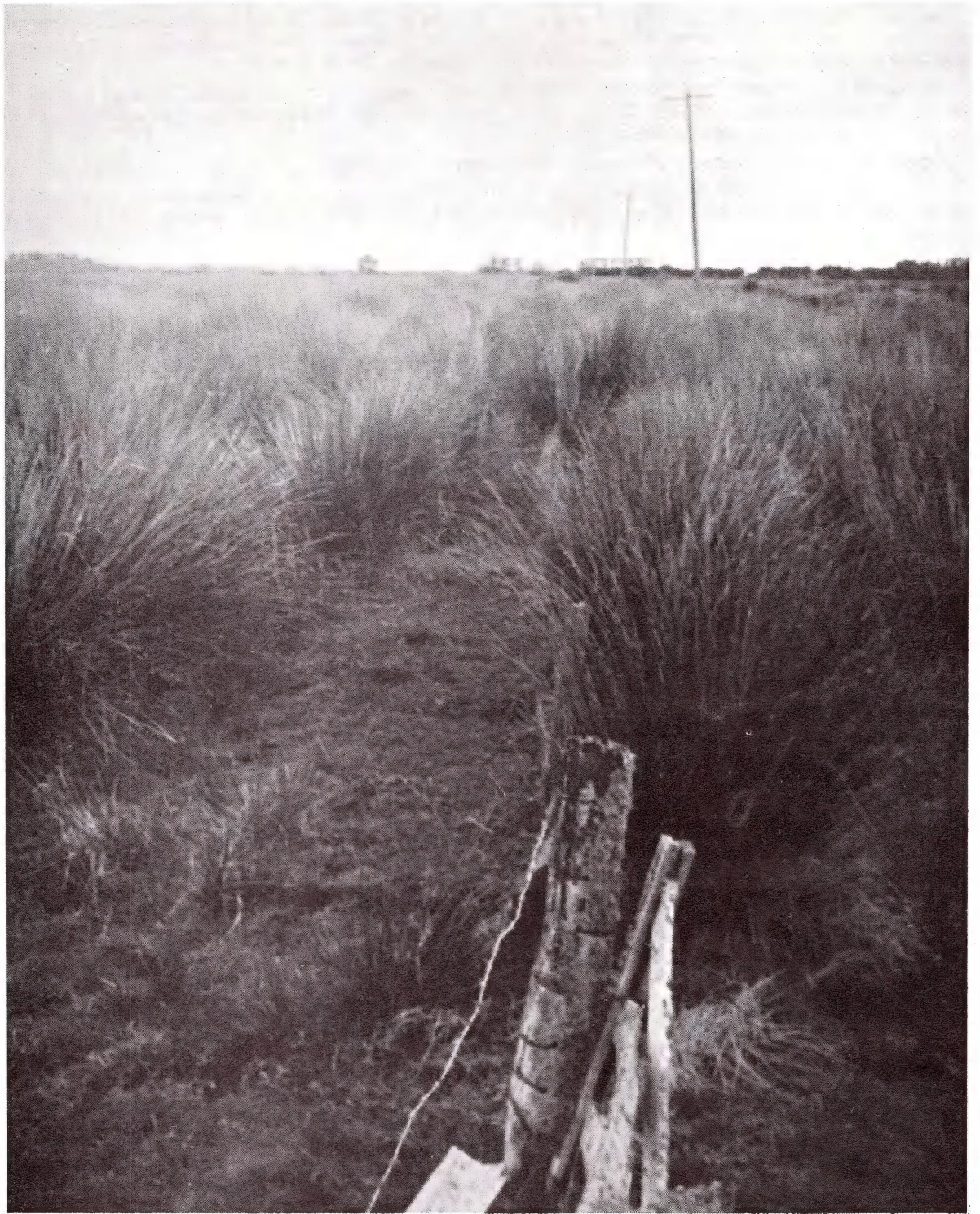


Parakanoi Drain taken at peg IM 4300' looking east before re-construction. April 1946.



Parakanoi Drain taken at peg IM 4300' looking east after re-construction. April 1946.





Wet lands of the drainage area prior to commencement of drainage operations. This photograph taken near Trigpole Road in 1945, shows a typical view of the reversion taking place in the Lowcliffe and other areas. Before reversion to wet land this area was producing 4t/ha (60 bushels/acre).



## **CHAPTER 8**

### **A.H.D.S. Maintenance Policy 1945-48**

The board was always mindful of maintenance needs of the newly reconstructed drains within the scheme. At a public meeting in Willowby in 1945 and again in 1946 at Tinwald, Hinds, Eiffelton and Lowcliffe when the drainage scheme was being explained at meetings of ratepayers, it was emphasised that approval of the scheme of works carried with it, approval of its future maintenance.

In 1946 in support of an application for a subsidy and for authority to raise a loan, a report and estimate was submitted to the S.C. and R.C. Council and to the Loans Board. This report regarded maintenance work as an integral part of the application.

Referring to future maintenance, the application, referred as follows:

"The board holds itself responsible for the future maintenance of all drains and cut-off channels being undertaken in the scheme and the board intends to strike a maintenance rate to provide the funds required."

It was consequent on this statement of policy that the subsidy was granted and the loan approved.

#### **1948/49**

This maintenance rate was not, however, struck. Instead an advertisement was printed in July, 1948, stating that the maintenance rate was postponed until the capital work was complete and asking farmers to clean any completed drain running through their property. It was pointed out that this policy would give farmers an opportunity to demonstrate their ability to keep their sections of main drains in good order, and the response would be taken into account when the board later determined its maintenance policy.

#### **THE IMPORTANCE OF EFFICIENT AND CHEAP MAINTENANCE**

Mr W. E. Lucy, the board's chief engineer, and staff were concerned about the deterioration of some drains which had been reconstructed some 2½ years earlier and immediately investigated efficient plant best suited for future maintenance work on A.H.D. drains.

Many different machines and methods have been used in endeavours to find suitable means of clearing drains efficiently, cheaply and quickly. Hitherto, draglines with weed buckets were used but it was found that possibly 10 of these machines working all the year round would be required to cope with the drains in the scheme. It was found that this slow rate along with the tremendous cost of keeping 10 machines, their operators, and the maintaining of this plant in the field all the year round, would make the maintenance of capital works very costly.

Enquiries were then made all over the world for a suitable machine to cover 400 metres (20 chs) an hour. The most experienced business concern handling this type of machinery could produce machines that could cover only 400 metres per day.

Meanwhile, during the six years needed to develop efficient drain cleaning machinery, farmers had been asked to keep drains clean. Farmers work, however, had been generally of a poor standard and the chief engineer advised the board that the cleaning of drains was inadequate and that at best only weeds were being removed.

In 1952 the works inspector reported that 65 km (40 miles) of drains had not been touched and that many drains were overgrown with aquatic weeds, that piecemeal, unco-ordinated cleaning was practically a waste of effort and that reversion to wet lands was fast taking place.

Late in July, in the winter of 1952, a drain cleaning field day was held in the Chatmos area on Windermere drain, Windermere Road. Mr Lucy and his staff proved to more than 50 farmers that after exhaustive trials held over many months the problem of quick and efficient drain maintenance had been overcome.

A 10 RB back acting trench hoe, with a special 3 m (10 ft) weed bucket or "Drain Scraper" fitted to the dipper arm in place of the standard gouging bucket. The drain scraper was towed by a TD 35 crawler tractor and this unit revolutionised the drain maintenance problem, being capable of maintaining and very efficiently cleaning drains at over 400 m (20 chs) per hour.

Where the time saving occurred was in the cleaner operator making the 3 m (10 ft) pass with the drain scraper bucket from the far bank drain batter, the towing tractor remaining stationary till the moment the 10 RB operator commenced the drag up the near batter. The towing unit then quickly moved along the drain 3 m (10 ft) and the cleaner operator having dumped the scraper load of weeds and silt parallel to, and clear of the drain, had the scraper bucket poised ready to commence another cleaning cycle and so on.

The success of the board's "Drain Scraper" unit had a profound effect on the implementation of full maintenance programmes for A.H.D.S. drains.

That same year, Mr Lucy reported to the board, that cleaning drains at a reasonable cost could now be achieved by the board's drain scrapers provided that maintenance machinery could move quickly along a good track beside each communal drain, in absence of unbridged side drains or other obstructions.



To provide adequate access would cost \$14,000 (£7,000) half of which would require to be found locally and half from subsidy. In December 1952 the board took steps to finance this work.

It decided to:

1. Immediately raise a 10% supplementary loan of \$8,000 (£4,000), apply for subsidy and prepare access to drains.
2. Strike a maintenance rate for 1953/54 on the existing classification to cover all maintenance and carry out the work with the new drain scraper.

It was also decided at this time to prepare a reclassification for maintenance with an advisory committee of ratepayers and to strike maintenance rates on the new maintenance classification.

In the first full maintenance programme in 1953/54 with two "Drain Scraper" cleaning units in operation the board's staff was able to clean 227 km (141 miles) at less than two-fifths of the cost of a special weed bucket which was at that time considered to be a great improvement on the standard dragline bucket.

#### **SUBSEQUENT MAINTENANCE 1954/55 TO DATE 1978**

From the initial maintenance run in 1953/54 until 1968 the 10 RB drainscraper units annually cleaned all the drains in the scheme as well as some 200 km (124 miles) of internal private drains for 100 farmers in the drainage area.

Because capital drainage works within the board's Ashburton area were decreasing the two 10 RB drain scrapers were transferred to Temuka in 1969 where one of them is still in use on the Seadown drainage and other work.

#### **MAINTENANCE BY CONTRACTOR MACHINES**

A policy change was made to employ private contractors on maintenance work on the A.H.D.S.

In the 1969/70 period an Ashburton contractor, Briggs Bros. imported from France a hydraulically operated four-wheel drive Poclain trench hoe, mounted on dual rubber tyres. Very manoeuvrable, and with a longer reach than the "Drainscraper" it was able to clean roadside drains without damaging the sealed roads which were being formed in the Ashburton county. Briggs Bros. adapted a three metre bucket based on the board's drainscraper.

Also, in the Eiffelton area Mr S. H. (Sam) Keating operated a side mounted drain cleaning weed bucket using a Fordson farm tractor.

Since 1970 these two contractor drain cleaners have maintained about 250 km of board drains per year or 62% of the total board drains cleaned annually.

#### **DRAIN MAINTENANCE BY CHEMICAL CONTROL**

Following several trials of drain maintenance by chemicals in 1967 the board included this form of weed control as an integral part of its annual maintenance programmes. For the 10 year period from and including 1968 drain maintenance by chemicals averaged 150 km or 38% of the total board drains cleaned annually.

Today, all A.H.D.S. drains are cleaned every year in the months of March and April and various factors are considered in assessing which drain requires light cleaning, (Keating) or heavy cleaning to maintain original cross section (Briggs) and chemical control (board's mobile spraying unit) of drains which conform to original cross section and with a good fall.

#### **OPINIONS OF FARMERS WITH LONG STANDING KNOWLEDGE OF DISTRICT**

Today any farmer in the A.H.D.S. district who experienced the chaotic and diffused drainage conditions prior to the advent of the South Canterbury Catchment Board taking over, without exception agrees that the drainage scheme is an unqualified success.

Most present day farmers, representative of different areas and soil types, agree that drainage "pays off" and the glowing remarks made by most land owners are but an indication of a well satisfied rural community, content to be relieved of a difficult and unwelcome task and pleased to be getting a service of far greater value than the cost in rates.

#### **1954 — RE-CLASSIFICATION FOR DRAIN MAINTENANCE**

To consolidate the maintenance programme in accord with its resolution of December, 1952, for a reclassification for equitable maintenance rates, the Board engaged the associate professor and head of the department of valuation and farm management at Lincoln College, to carry out the new classification. He spent several days in the field carrying out the necessary inspections.

On November 26, 1953 the A.H.D.S. ratepayers committee representing the various areas and the 800 ratepayers in the scheme met Board members and staff to consider Professor Flay's classification. The local committee comprised Messrs C. W. Anderson, W. M. Skevington, J. R. Cocks, D. C. MacFarlane, S. P. Taylor, A. M. Davidson, M. Wilson, W. F. Mulligan and J. Blair.

Dr Woodhouse pointed out to the meeting that he wished complete acceptance of the proposed maintenance classification and that any adjustments, even to one property would throw the remainder of the 800 ratepayers classifications open to appeal which would take several months to resolve at considerable expense with only minor adjustments to assessments. The A.H.D.S. ratepayers committee examined the proposals and after minor adjustments the classification was approved.



Later a circular letter was posted to every ratepayer in the Ashburton–Hinds Drainage district as follows:

“A meeting of ratepayers of the Ashburton–Hinds Drainage District will be held in the Eiffelton Hall at 8 p.m. on Wednesday December 9, 1953.

#### **Business:**

Explanation by Professor A. H. Flay, Lincoln College, of proposed reclassification of the district for the maintenance of an efficient drainage system.

By way of explanation and to inform ratepayers of the board's view on the proposed classification for maintenance, Dr Woodhouse penned the following which was included in the circular letter to all ratepayers:

“In 1946 in support of its application for subsidy on the original work and of its application to raise a loan, the board stated that it held itself responsible for maintenance and intended to strike a rate for that purpose. This was not done, however, because many ratepayers felt that the original classification for rating was proving inequitable in that some ratepayers in low valued land, which received great benefit from the work, paid a comparatively small amount in rates and would thus contribute little to the cost of maintenance, and for this reason ratepayers in general wished that the responsibility of cleaning should rest on those ratepayers through whose properties the drains ran.

“The board agreed to give this proposal a trial but although some drains were maintained properly, many were neglected and in 1952 it was obvious that the Board could not reasonably defer taking charge of the maintenance itself. For 1953/54 it struck a maintenance rate on the existing classification on the understanding that the district would be re-classified for maintenance in the future. The present classification is a modification of the existing classification in accordance with that undertaking.

“In conjunction with the re-classification the drainage needs of the whole district have been examined and where it appeared that lands were inadequately served by drains, the Board has approved the construction of additional drains at an approximate cost to the rating district of \$10,400 (£5,200). The present re-classification is based on the assumption that these additional drains will be constructed during the next two to three years.

“Professor Flay was appointed classifier and his study of the case showed him that the area could be quickly, cheaply and reasonably accurately classified on broad lines, but an exact classification, suitable to a magistrate hearing appeals, would take several months to prepare and would cost up to \$2,000 (£1,000) which is not available at present, and would, when completed, differ at most very slightly from the present proposed approximate classification.

“The Ashburton committee of the board and the Ashburton–Hinds Ratepayers Committee met together on November 26, 1953, and examined the proposal, and after minor adjustments the re-classification was unanimously approved.

“It is hoped that this classification will be approved also by all ratepayers but unless they are unanimous in accepting the proposed re-classification it will be withdrawn and the board will then have to proceed at some future date when funds are available, with a detailed classification and continue meanwhile to rate for maintenance on the old classification.

“The proposed re-classification is for rating for the maintenance only of efficient drainage of the district. The rate for loan charges must remain on the original classification.

At this very well attended ratepayers meeting in the Eiffelton Hall an unanimous resolution was passed requesting that the board carry out annual cleaning of the Ashburton–Hinds drainage system within the months of April and May<sup>1</sup>.

The classification was open for inspection and possible objections for a period of 28 days at the Ashburton office. There were no formal objections to Professor Flay's classification and therefore, the drainage scheme maintenance proposal was assured. The proportion on which the rate was imposed on the several classes was: A 30; B 20; D 7; E 5; G Exempt.

#### **1964 CLASSIFICATION OF SMALL AREA, WEST OF SWAMP ROAD, MORONAN FOR CAPITAL WORKS AND FUTURE MAINTENANCE**

In May, 1961, the board received a petition signed by Mr M. G. Davidson and eight others asking to have a stormwater cut-off constructed along Swamp Road in order to trap stormwater mainly from the western side of Swamp Road, which flowed uncontrolled through wide, shallow, natural depressions and along Swamp Road itself before finding its way by various routes into the already overtaxed McLeans Swamp Road drain and Barford Road drain, to finally pond up in the properties of W. W. Lowe and W. A. Henderson immediately above the Main Trunk Railway Line.

Board members carried out inspections during the heavy storms of 1961, to find that the area was being subjected to considerably worse stormwater flooding than other areas in the rating district. It was decided that the cut-off be constructed subject to the property owners on the western side of the road agreeing to be rated for stormwater benefits similar to those property owners on the eastern side of the road.

This drain 3.62 km in length, known as Dicksons cut-off drain was constructed in 1965 and added to the scheme. The board's classifier, Mr J. W. T. Anstey, added 134.13 ha (330 acs) of formerly class G land west of Swamp Road into the Ashburton–Hinds Rating District, which was originally classified in 1946 and amended on re-classification in 1954 for maintenance purposes.

1. At the request of farmers' groups some 10 years ago the period for maintenance was changed from April–May to March–April.



## UP-DATING 1954 CLASSIFICATION

### 1971 — Re-classification for maintenance by Mr A. C. Norton

Inequities in the scheme maintenance provision became apparent in the late 1960's and the basis of rating was changed.

On July 8, 1971, the chief engineer of the board Mr T. L. (Tom) Fancourt advised the board that the Ashburton-Hinds drainage classification for maintenance was not equitable in the light of changing circumstances which had occurred since Professor Flay's classification in 1954. He strongly recommended that the area be re-classified on an acreage basis and not on capital valuation as in the 1954 maintenance classification.

Mr A. C. Norton, the classifier for the North Canterbury Catchment Board since 1957 was appointed classifier to re-classify the A.H.D.S. area in accordance with the S.C. and R.C. Act, 1941 and amendments thereto. Mr Norton had previously carried out 19 successful classifications for several catchment boards in the South Island.

It was also resolved that 28.98 km (18 mls) be declared additional drains for the purpose of maintenance subject to the property owners, where necessary carrying out work to bring the drains up to the standard deemed necessary, or where no drain exists, constructing such a drain to the board's satisfaction.

The board and the Ashburton Borough Council both agreed to the continuation of a lump sum annually by the borough council towards the cost of maintaining the Ashburton-Hinds Drainage Scheme in lieu of rating individual properties in the Tinwald area of the Ashburton borough.

All the land in the Tinwald area of the Ashburton borough was classed U.1 and with benefits from maintenance work on the upper stream portions of the Carters Creek and the Lagmhor Creek systems together with benefits from the Shepherds Bush cut-off and the Timaru Track cut-off.

The approach in the classification was that of regarding the benefit from the drain maintenance as being an average benefit to a property or any part of a property.

The points of benefit for the several classes are:

Class A	100 points
Class B	70 points
Class C	50 points
Class D	30 points
Class E	20 points
Class F	10 points
Class U.1	60 points

The points of benefit system is valid only for rating on an acreage basis.

Mr Norton was strongly of the opinion that there should be a change in the rating basis and proposed future rating be on the hectares in each class, and not on capital value. Hectare rating is considered to be particularly suitable for drainage schemes, as the benefit is primarily to the land itself and not necessarily related to improvements, such as buildings.

In due course, after the completion of field inspections Mr Norton's classification was adopted by the board on November 10, 1971, the classification list was signed by the chairman of the board Mr T. P. Lowe and deposited at the Ashburton office for inspection by the public from November 17, to December 17, which was later extended to January 21, 1972.

There were 19 objections to the re-classification which were reduced to nine after meetings between the objectors and the classifier at the board's Ashburton office. These nine appellants who objected to their maintenance re-classification were the same hard-core group who strongly objected to the original 1946 drainage classification for capital works and the 1954 classification for maintenance.

The district from which the appeals arose was in Moronan and confined to those lands bounded generally to the south by the Hinds River. It is a narrow strip having its origin at the Flaxmere swamp and finishing at the railway line.

The appeals in the main were concerned with three drains, Mulligans cut-off which was originally constructed by the Ashburton County Council before the formation of the South Canterbury Catchment Board. It was taken over by the board and later, twice extended. The last extension was in 1954. The other two were Barford Road drain constructed in 1955 following representations to the board, and Dicksons cut-off drain constructed in 1955, again following representations to the board.

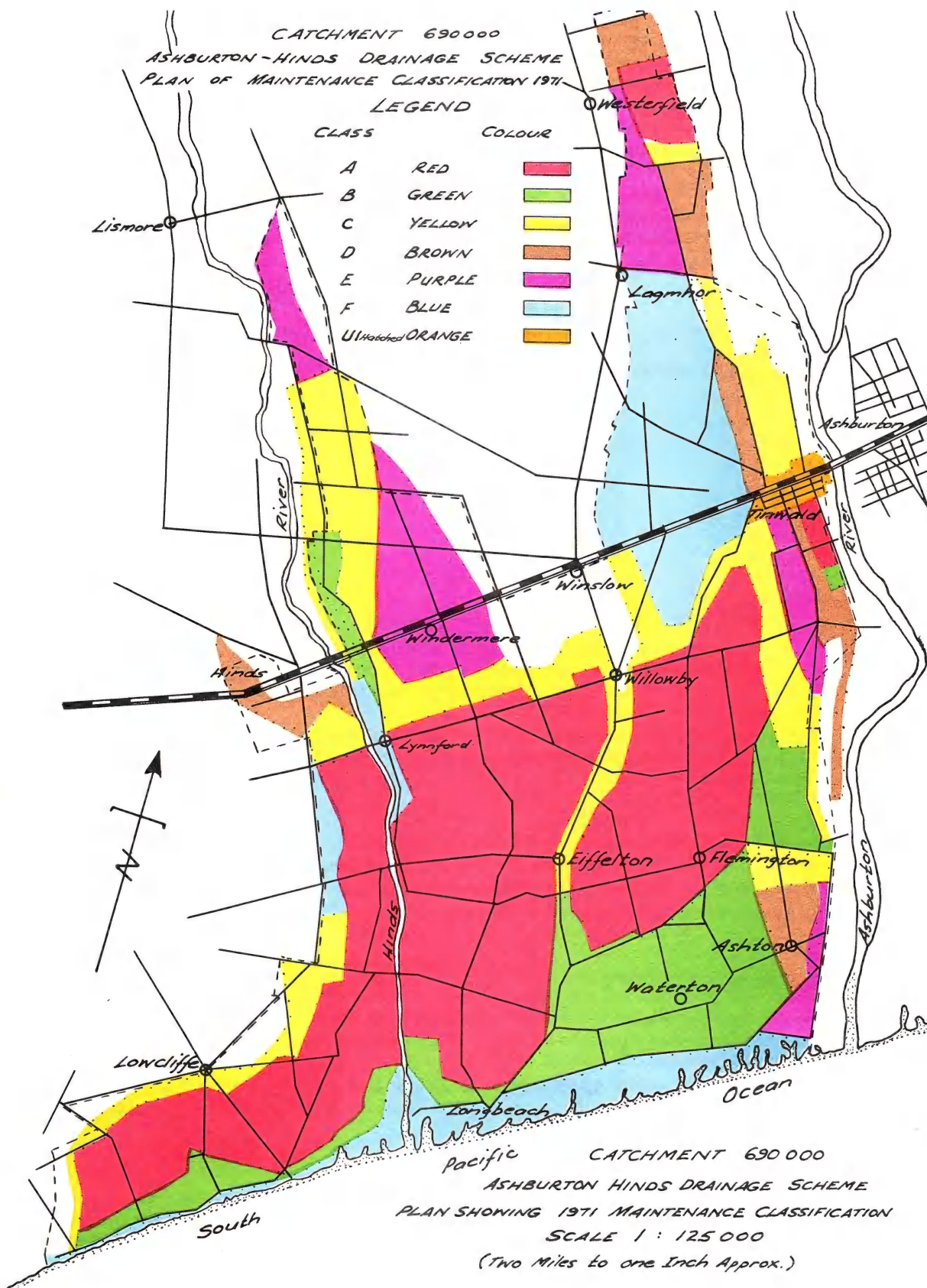
It is worthy of comment that some of the appellants asked for construction of the Barford Road drain. Indeed, some asked for both. It is significant that despite these requests the benefit derived was said by the appellants to be slight.

The appeals were heard on April 10-12, 1972, and in dismissing them, the Stipendary Magistrate, W. M. Willis said:

"I freely concede as I have always done, that another classifier might have come to a different conclusion when classifying this land. Indeed, if it were classified by any number of classifiers I doubt that they would produce identical classification plans. It seems to me, that viewing the classification as a whole the classifier has made an honest attempt to spread the burden of the rates equitably so as to provide a basis of rating that is equitable as between ratepayers and between groups of ratepayers.

"It seems to me that the classifier has not made any error in the classification and that he has correctly assessed the benefits direct and indirect in accordance with the provision of the Act. Some of the old natural channels have all but disappeared due to cultivation following protective works, either constructed by the board or taken over by the board and maintained by it. Rather than complain that the rates are going to be increased they may well have good grounds for counting their blessings and be grateful for the fact that





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Figure 7



they have not had to pay a higher rate for the past 20 years. Three of the drains were constructed as a result of representation to the board. This seems to indicate that at the time the requests were made there was a need for some form of protection from floodwaters, the evidence seems to me to show plainly that what was once a problem is part of a forgotten past.

"The appeals are dismissed."

## MULTIPLE USES OF WATER

### Water — Too Little and Too Much

The lack of surface water in Ashburton County was the reason for the division of the plains into pastoral runs, where each run was given a river frontage. The areas adjacent to water became the ewe and hogget country, while the Merino wethers were put out on the waterless land of the high interfluvies. The digging of stock water races was most important. In the early 1870's the difficulty of intensive utilisation of the land lay in the inaccessibility of water for stock.

Many former diggers from the Otago gold rush of 1861 settled in the district and their knowledge of water-races was put to good use to construct a network of stockraces. In Ashburton County over 1,600 km (1000 mls) of water races had been constructed by 1894, serving 17,000 hectares (420,000 acs.) of the 304,000 ha (750,000 acres) of plains within the county. In fact, a gigantic water-race system developed and today a network of over 4,800 km (3000 miles) of water races services the county rural farm lands.

In some areas of Canterbury there is too little water and in others there is, or has been, too much. This is particularly true of the heavy lands of the coastal plains where extensive swamps have been drained and converted into some of the most valuable and productive farm land in Canterbury. The removal of surplus water and the local lowering of the water tables were early and important activities of European settlement in Ashburton County and other coastal areas. The transformation of the swamps of Coldstream — Longbeach into high production farms is an epic story that is paralleled in other areas. In the process of draining the land, water-courses have been turned into man made drains, rivers controlled within stopbanks and, as with the lower Hinds River, a new outlet channel was dug. Arising from this drainage, the last three decades have witnessed a co-ordination and development of water control through catchment boards which cover the plains area as well as mountain country.

## IRRIGATION IN THE A.H.D.S. AREA

The upsurge and impetus to irrigation over the past decade has been brought about by the implementation of the Water and Soil Conservation Act of 1967. This development was influenced by several particularly dry years such as the 1964/65 growing season in Mid-Canterbury which was the worst drought in 50 years. Other dry years were 1969, 1971, 1972 and more recently the drought of 1978 highlighted the unequal distribution of rainfall in Ashburton County.

In the Ashburton-Hinds drainage area in dry years there is an extreme shortage of water for irrigation purposes. During one such period 1.6 cumecs was gauged from 25 board drains which discharge to the sea and the flood flow from the same drains three months later was 230 cumecs.

To counter these dry seasons, and to increase production by irrigation-oriented farming, the catchment board had approved applications by several farmers for the taking of water from the Hinds River and from board drains prior to the Water Act of 1967. The farmer who pioneered this was Mr J. R. (Ron) Cocks who at that time farmed near Black Bridge, Surveyors Road. His application to take water for irrigation of crop and pasture from the Hinds River, Fifty Link and Daley's drains was approved on April 7, 1960.

## SOUTH CANTERBURY CATCHMENT BOARD AND REGIONAL WATER BOARD

At the end of October 1977 the number of registered irrigators in the Ashburton-Hinds Drainage Area was as follows:

### Water Abstraction — Ashburton-Hinds Drainage Area

Number Registered Irrigators	87
Total water used per week	1,240,212 m <sup>3</sup>
Area Irrigated (based on 250 m <sup>3</sup> /ha/wk)	4961 ha
In this area there are 61 surface and 46 underground sources	

### From Hinds River — Within A.H.D.S. area

Number Registered Irrigators	41
Total water used per week	560,279 m <sup>3</sup>
Area Irrigated (based on 250 m <sup>3</sup> /ha/wk)	2,241 ha
In this area there are 36 surface and 15 underground sources.	

### Combined A.H.D.S. and Hinds River

Number registered irrigators	128
Total water used per week	1,800,491 m <sup>3</sup>
Area irrigated (based on 250 m <sup>3</sup> /ha/wk)	7,202 ha

Sources: Surface	97 sources
Sources: underground	61 sources

Note:

The number of sources for irrigation is considerably larger than the number of registered irrigators. This is because some irrigators have several sources of withdrawal.

The figures for water used and area irrigated must be accepted as approximately only.



### **CONCLUSION**

As has been stated, in general, the soils of the area are moist and easily worked. They overlie a high water table and are liable to become very wet and because of these factors it is of paramount importance to have good drain maintenance.

On the inherently wet lands of the Ashburton-Hinds drainage area, following abnormally high precipitation such as occurred in 1945, 1951, 1957, 1968, 1975 and 1978 subterranean groundwater flows will surface in the vicinity of State Highway 1 to be trapped by the board's intercepting drainage system above and parallel to Boundary Road.

It should be remembered that the area is still primarily a drainage district and that the necessity for a modern drainage scheme and its historical relation to landscape development. The nature of the cultural landscape is fragile with a thin line only existing between its advancement and its retrogression. The board and its engineers have fully realised the significance of these factors and have planned the continuance of drain maintenance so that advancement may be permanently assured.



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